GEOGRAPHY DELINEATED FORTHINTWO BOOKES

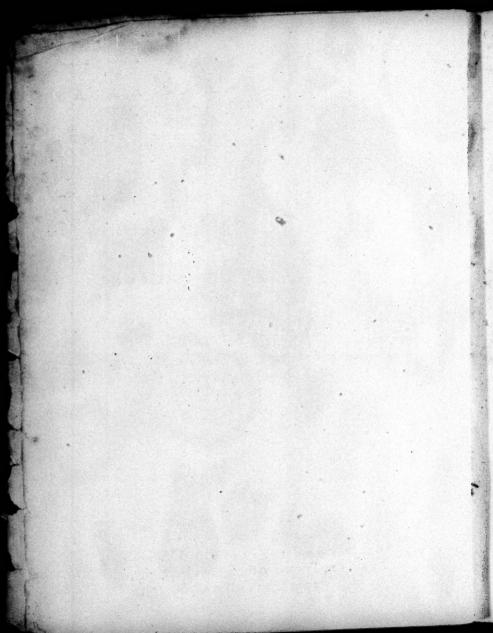
CONTAINING THE SPHERICALL
AND TOPICALL PARTS
THEREOF.

By NATHANABL CARPENTER
Fellow of Exceter Colledge
in Oxford.

ECCLESIAST. I.
One generation commeth, and another goeth, but the
Earth remaineth for euer.



OXFORD,
Printed by IOHN LICHTIELD and WILLIAM
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TO THE RIGHT HONOVRABLE WILLIAM,

EARLE OF PEMBROKE, LORD CHAMBERLAINE to the Kings most excellent Maiesty. Knight of the most Nobles

Order of the Ganten, and Chauncellour of the Vni-versity of Oxford.

Right Honourable,



His poore Infant of mine. which I now offer to Your Honourable acceptance, was consecrated Tours in the first conception: If the hafly desire I had to present it,

makes

THE EPISTLE

makes it (as an abortiue brat) seeme vnworthy my first wishes, and Your fauourable Patronage: imputeit (Ibeleech You) not to Selfe will, but Duty; which would rather thew her felf too officious, then negligent. What Inow dedicate rather to Your Honour, then mine owne Ambition, I defire no farther to be accompted Mine, then Tour generous approbation: wishing it no other fate, then either to die with Your Dillike, or line with Your Name and Memory. The generall Acclamation of the Learned of this Age, acknowledging with all thankfull Duty, aswell Your Loue to Learning, as Zeale to Religion, hath long fince stampt me Yours. This arrogant Defire of mine, grounded more on Your Heroick vertues, then my privat ends, promised me more in Your Honourable Estimation. then some others in Your Greatnesse. The expression of my selfe in these faculties beside my profession, indebted more to Loue, then Ability, setts my Ambition a pitch higher then my Nature. But fuch is the Magnificent splendour of Your Countenance, which may easily lend Your poore Servant somuch light

DEDICATORY.

as to lead him out of Darknesse; and, as the Sunne respecting on the baser Earth, at once both view and guild his Impersections. My language and formality I owe not to the Court, but Vniversity; whereof I cannot but expect Your Honour to be an impartiall Vmpier, being a most vigorous Member of the one, and the Head of the other Corporation. If these fruites of my Labours purchase so much as Your Honours least Approbation, I shall hold my wishes even accomplished in their ends, and desire onely to be thought so worthy in Your Honourable esteeme, as to live and dy

Your Honours poore Servant

to command.

NATHANAEL CARPENTER.

The Analy fis of the first Booke. Principles wher cofit confifts, to wit, Matter and Forme. Chapter 1. Elementary : as the conformity of all the parrs concurring to the constitution of the Spheare. Chapter 2. Earthit felf: which are Partiall: as the Coition, Direction, Variation, Declicither nation: Chap. 2. Naturall. Real : fuch wherein are as a saffigto be confi-Magnetined in redered two call: which fper of the things: the Lare either Totall: as the Verticity and Revolution: Chap.4. Primary, which con-Proprieties fiders the Terreftrially Heauens: wherein we treate of the Site, Stability, and Proportion of the Earth arifing out Spheare either as it is Lin respect of the Heavens. Chapt. 5. of them; which a-Sphzricall. Imaginary: fuch as are the Circles and Lineaments of the Globe, of whose Invention and Exwhich is gaine are I prefion. Chap. 6. Leither two-fold. either Artificial: in the Artificial Spleare representing the Natural vnto vs: which is either Common or Magnetical. Chap. 7. Measure of the Earth, with the diverse manner of Invention. Secondary handles fuch matters in Simply in themselves, in which fort they are divided into Zones, Climates, and Parallels. the Spheare as feconda-Chap. 9. rily arise out of the first. Spaces con-Such are the fidered In respect of the Inhabitants: which suffer manifold Distinction. Distinction which is Leither of Earth, is ci-Simple: wherein is considered the Longitude and Latitude places. Chap. 11. Diftances which are cicher Comparative: wherein two places disering either in Longitude or Latitude, or both, are confidered. Chap.1 30 Topicall, Place this Analysis before ¶¶

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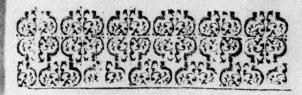
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To my Booke.

PArve, nec invideo, sine me (Liber) ibis in Aulam, Hei mihi quòd Domino non licet ire tuo.

Goeforth thou haplesse Embrion of my Braine, Vnfashion'd as thouart; expresse the straine And language of thy discontented Sire, who hardly ranfom'd his poore Babe from fire, To offer to the world and carelesse men The timeleffe fruits of his officious pen. Thou art no louely Darling, stampt to please The lookes of Greatnesse; no delight to ease Their melancholy temper, who reiest As idie toyes but what themselves affect. No lucky Planet darted forth his Rayes To promise love vato thy infant daies: Thou maist perhaps be marchandise for saues, who fell their Authors wits and buy their graves: Thou maist be censur'd guilty of that blame, Which is the Midwifes fault, the Parent's Shame; Thoumaist betalke for Tables, us'd for fort At Taverae meetings, pastime for the Court: Thoumaist be torne by their malicious phangs, Who nere were taught to knowe a Parents pangs.

9 9 8

How

How eas'ly can proud Ignorance outstare The comeliest weeds thy poverty can weare; when all the Sisters on our Isis side Are oft sworne servants to aspiring pride, And our renowned Mother Athens groanes To fee her garden fet with Cadmis fonnes : whose birth is mutual strife: whose destiny Is only to be borne, to fight, and dy. Frometheus is chain' dfast, and cannot moue To seale a little firefrom mighty love To people new the world; that we may fee Our Mother teeme with a new progenie; And therefore with thy haple fe Father prone Toplace thy duty where thou findest lone. When thou arriv fl at Court thou long mai fl flay Some Friends affiftance to prepare thee way; As in a clowdy morning I have done When envious Vapours shut me from the Sunne. when all else enter, see thou bumbly fland To begge a kiffe from thy Mæcenas hand. If he wouch safe a looke to guild thy sate, Proclayme him Noble, thy selfe for sunate.



GEOGRAPHIE:

THE FIRST BOOKE.

CHAP. I. Of the Terrestriall Globe, the matter and forme.

EOGRAPHIE isascience which teacheth the description of the whole Earth.

The Nature of Geographie is well expressed in the name : For Geographie resolued according to

the Greeke Etymologie, fignifieth as much as a description of the Earth; fo that it differs from Colmographie, as a part from the whole. For a much as Comographie according to the name, is a description of the whole world, comprehending under it as well Geographie, as Aftronomie. Howbeit, I confesse, that 2mongst the ancient Writers, Cosmographie hath bin taken for one and the selfe-same science with Geographie; as may appeare by fundry treatifes meerely Geographicall, yet intituled by the name of Cosmographie. This Science (according to our appro- Ptolom. geued Prolomie) is distinguished from Chorographie foure wayes, ogr.l. s feet

First, because Geography describeth the whole Spheare of the Earth, according to its iuft quantity, proportion, figure, and difpolitions, which the principall parts of it ha ue; as well in respect of one another, as of the whole Terrestrial Globe: so that it only vndertakes the chief and most noted parts, such as are sines, creckes, nations, cities, promontories, rivers, and famous mountaines. But the Chorographer separatly handleth the leffer parts, and matters of finaller moment, fuch as are hillocks, brookes, lakes, townes, villages, and Parishes, without any respect at all to the places adiopning, as conferring them with the Sphericall fabrick of the whole Earth: Which by the fame Author is well illustrated by an example, drawne from the Painters Art: For we fee that a Painter, defrous to draw out and represent the head of any living creature, will first draw out the lineaments of the first and greatest parts; as the eyes, eares, nose, mouth, forehead, and fuch like; only caring that they may challenge a due & iust proportion and symmetrie one with the other, not regarding the leffer particles and ornaments in each of thefe, wanting perhaps space competent to accomplish it. But if the fame Painter would frine to expresse only an eye, or an eare, he might take space enough to designe out every smaller lineament, colour, shadow, or marke, as if it were naturall : for in this he cares not to make it correspondent to the whole head, & other parts of the body: So happens it to the Geographer, who willing to delineate out any part of the Earth, (as for example, our Realme of England) he would describe it as an Iland, encompassed round with the sea, & figured in a triangular forme, only expressing the principall and greater parts of it. But the Chorographer undertaking the description of some special and timaller part of England; as for example, the City of Oxford, descends much more particularly to matters of small quantity and note: fuch as are the Churches, Colledges, Halls, Streets, Springs; giving to each of them their due accidents, colours, lineaments, and proportion, as farre forth as Art can imitate Nacure. Neither in this kind of description needs there any con-Aderation of the places adiopning, or the general draught of the whole lland. The second difference between Geographie and Cho-

Cherograph'e afligned by Ptolomie, confifts in this; that Choregraphie is commonly conversant in the accidentall qualities of each place, particularly noting vinto vs, which places are barren, fruitfull, landy, ftony, moiff, dry, hot, cold, plain, or mountainous, and fuch like proprieties. But Geography leffe regarding their qualities, inquires rather of the Quantities, meafures, distances, which places have as well in regard one of the other, as of the whole Globe of the Earth : affigning to each region its true longitude, latitude, clime, parallell, and Meridian. 31, Geographie and Choregraphy are faid to differ, because Geographie Stands in little need of the Art of Painting, for as much as it is conversant the most part about the Geometricall lineaments of the Terrestriall Globe, clayming great affinity with the Art called of the Greeker, Ichnographie; whose office is to expresse the figure & proportion of bodies, fet forth in a plain [uperficies. But contrary w fe Chorographie requires, as a he'p necesfary, the Art of Painting; for almuch as no man can fully and perfectly expresse to the eye the true portraid of cities, towns, castels, promontories, & tuch other things, in their true colours, huely-hood, & proportion; except they be skilled in the Art of Painting. So that this part is by some likened to that Art which the Greekes call Sciograptie, or Scenographie. Fourthly, & lastly, Geographie is diffinguished from Chirographie, in that the former confidering chiefly the quantity, measure, figure, fite, & proportion of places, as well in respect one of the other, as of the Heauens, requires necessary helps of the Sciences Mathematicall, chiefly of Arithmeticke, Ceometry, & Astronomic, without which a Geographer would shew himsel: every-where lame & impotent, being not able to wade thorough the least part of his profession: whereas a man altogether vnpractifed in those faculties, might obtaine a competent knowledge in Chorography. As we find by experience, some altogether ignorant in the Mathematicks; who can, to some content of their hearers, Topographically, and Historically discourse of Countries, as they have read of in books, or observed in their travaile. Notwithstanding all these differences assigned by Ptolomie, I see no great reason why Chorographie should not be referred to Geographie; as a

A 2

part to the whole; for a fruch as the objects on which he hath grounded his diffinction differ only as a generall and a speciall; which being not opposite, but subordinate (as the Logicians vie to speak) cannot make two distinct Sciences, but are reduced to one & the selfe-same : at least the differences thus aff-gned, will not be Essentiall, but Accidentall. Wherefore my scope in this Treatise shall be to loyne them both together in the same, so far forth as my Art and leisure shalbe able, to descend to particulars; which being in Chorographie almost infinite, will not all feer e alike necessary in the description of the universall Globe of the Earth. The name of Geographie thus distinguifled, we define it to be a Science which teacheth the Measure and Description of the whole Earth. It is properly tearmed a Science, because it proposeth to it selfe no other end but knowledge; whereas those faculties are commonly termed Arts. which are not contented with a bare knowledge or speculation, but are directed to some farther work or action. But here a doubt feemes to arife, whether this Science be to be esteemed Physicall, or Mathematicall? We answere, that in a Science two things are to be confidered : first, the matter or object whereabout it is conversant; secondly, the manner of handling and explication : For the former, no doubt can be made, but that the object in Geographie is for the most part Physicall, confifting of the parts whereof the Spheare is composed : but for the manner of Explication, it is not pure, but mixt; as in the former part Mathematicall, in the second rather Historicall; whence the whole Science may be alike tearmed Mathematicall and Historical; not in respect of the Subject which we have said to be Phylicall, but in the manner of Explication. For the object of Geographie (as we have intimated) is the whole Globe of the Earth: where we are to obserue, that the Earth may be considered 3 manner of wayes: First, as it is an Element, out of which mixt Bodies are in part compounded: In which sense it appertaines to Natural Philosophie, whose office is to treat of all naturall bodies, their principles and proprieties. Secondly, as it is

supposed to be the center of heavenly motions, and so it is vndertaken by Astronomers. Thirdly according to its Spharicall faperficies, as it is proposed to be measured or described, in which manner it is the subject of Geographie, so far forth as the parts of it have a diverse situation, as well in regard one of another, as in respect of the Heavens. Which restriction, although agreeing well to some part of it, will hardly square with all the restriction many things herein are handled besides the Earths naturall site or position, as hereafter shall be taught. For which cause we have rather defined the subject of Geographie to be the Earth, so far sit is to be measured and described, as wanting one word to expresse the whole manner of consideration.

2 Geographic confifts of 2 parts, the Sphæricall, and Topicall: The Sphæricall part is that which teacheth the naturall constitution of the Terrestriall Spheare.

The common and received division of this Science amongst Geographers, is into the General or vniuerfall part; and the Speciall. Which division, I dare not veterly reject, being strengthened with the authority of ancient & approued Authors. Yet seems it more aprly to be applied to the Historicall part, thento the whole Science, as we shall after make apparant. In the mean time the division of it into Sphæricall & Topicall parts, seemes to be preferred in reason: Forasmuch as the Terrestrial Globe. which we suppose to be the subject of the Science, is proposed to vs vnder a twofold confideration; first in regard of the Mashematicall lineaments and circles, whereof the Spheare is imagined to confift; out of which we collect the figure, quantity, fire, and due proportion of the Earth, and its parts: Secondly, of the places Historically noted and designed out vinto vs , by certain names, marks, and characters. The former receiveth greatest light from Astronomie, whence some have called it. the Astronomicall part: The later from Philosophie and Hi-Storical observation, being (as we have said) a mixt Science, taking part of divers faculties.

AS

3. The

3 The Terrestrial Spheare is a globous or round Body, comprehended within the furperficies of the Earth and Water.

Some have nicely diffinguished betwixt a Spheare and an Orbe; that a Spheare is a round massie body, contained in one surface, which is convexe or outward as a Bowle. The other concave, or hollow, in manner of an Egg-shell emptyed. But this distinction seemes too curious, as surouning too much of Scholasticall subtility, because the name of Orbe and Spheare are many times promiscuously vsed, without difference, amogst good Writers. This Spheare which we make the subject of our Science, we call Terrestriall, no: because it consists meetely of Earth; (the contrary of which we shall hereafter shew;) but because the Earth is the chiesest in the composition; whence by a tropicall kind of speach, the whole Globe may be called Terrestrials.

4 The handling of the Terrestriall Spheare is either Primary, or Secundary. The Primary consists in such affections as prima-

rily agree to the Earth.

The Geographicall Affections may be confidered two wayes, either fimply and absolutely in themselves; or comparatively as they are conferred & compared the one with the other. As for example, the circles of the Spheare, such as are the Parallels and Meridians, may be considered either absolutely in themselves; or comparatively as they concurre to the longitude, latitude, deflance, or such like accidents, which arise out of the comparison of one Circle with another.

fidered, is either Naturall, or Artificiall. The Naturall is the true Globe in it selfe, without image or representation.

6 Herein

6 Herein againe are to bee considered two things; First, the *Principles* and constitution of the Spheare; Secondly, the Accidents and proprieties: The principles whereof the Spheare is composed are two; viz: Matter and Forme.

7 The Matter is the substance whereof the Spheare is made, viz: Earth, and Water.

My meaning is not in this Treatife to handle the nature and proprieries of these two Flements, Water, & Earth, farther then may feeme necessary for the Geographicall constitution of the Terrestrial Spheare, leaung the rest to the Natural Philosopher; because it is supposed that few men vndertake the study. of this Science, without some infight in the other. And to speak truth, this begins where the Naturall Philosopher ends. Yet because some light in each learning is necessarily required, 'and all men are not willing to feek farther into the grounds of Naturall Philosophie; it will not seeme altogether impertinent, to lay the foundation farther off, that the building thereon erected may stand surer and stronger. Wherefore taking some beginning from the matter of the Earthly Globe, we have diffinguished it into Earth, and Water, as those parts whereof the whole Globe is not effentially compounded, as one intire body in it selfe; but rather coaccivated and compacted together, each part retaining its own nature and proprieties, without any proper mixture. To expresse more fully the constitution of this. Spheare, we are here to diftinguish betwixt the first and second. matter. The first matter was that vniverfall chaos, or masse, out of which, all bodies both Celestiall and Elementarie were made & formed, as we read in the first of Genesis. Which whether it be the same with Aristotle's Materia prima, as some haue imagined, I leave to others to dispute. The second matter of the Globe is either Froper or Accidentall, The proper we call that whereof

whereof the Globe of the Earth most properly consists, such as are the two Elements of Earth & Water. The Accidentall matter is vinderstood of all other bodies, contained in the superficies of the said Spheare, as Stones, Mettals, Minerals, and such like materials, made of a Terrestrial substance, & engendred in the wombe of the Earth. Concerning the Earth and Witer, which we make the most proper and essential parts of the Spheare, we will set down these two Theorems.

I In the Terrestriall Spheare is more Earth then VV ater.

The Theoreme may be proued by fundry reasons drawne from Nature and Experience. Whereof the first may be taken from the depth of the waters, compared with the whole thicknes of the Earth. For the ordinary depth of the Sea is seldome found to be about 2 or 3 miles, and in few places 10 furlongs, which make a mile and a quarter. And albeit fome late Wiiters have imagined the observation to be understood only of Braight and narrow Seas, and not of the main Ocean: yet granting it to amount to 10, 20, or 30 miles, it cannot reach to fo great a quantity, as to come neare the greatnes of the Earth. For the whole circle of the Terrestrial Spheare being 21600 English miles, (allowing 60 English miles to a degree of a greater circle) we shall find the Diameter to be about 7200 miles: Whole semi-diameter, measuring the distance between the center & the Superficies of the Earth, wil be 3600 miles. And if any man suppose some of the quatity to be abated, because of the Spharicall swelling of the Water about the Earth, whose Circle must be greater then that of the Earth: We answer; first that this may challenge some abatemet, but not come neare any aguality of the Water with the Earth. Secondly it is to be imagined that the furface of the Sea, howfoeuer as it is painted in Globes and Charts, it seeme for a great part empty and vufurnished of llands; yet this for the greatest part, seemes rather to be ascribed to mans ignorance, & want of true discouery, be--cause many quillets and parcels of land lye yet voknown to our Christian World, and therefore omitted, and not figured in

our ordinary Mappes. So we find a great quantity of Earth which lay hid and vnknown without discouery, in the dayes of Ptolomy, which caused him to contract and curtaile the Earth In his Geographicall descriptions. Which desect hath bin fince that time supplied by the industrious travailes and Navigations of later time: such as were of Pertugals, English, and Hollanders; especially of Columbus the Italian, who (as one wittily alluding to his name) like Noah's Doue plucking an olive branch from this Land, gave testimony of a portion of Land as yet vnknown, and left naked vnto discovery. And no question can be made, but a great quantity of land, not yet detected by our European Navigators, awaites the industry of this age. To which alludes the Poët in these verses:

Senecain Meden. All.

Venient annis fecula feris, Quibus Oceanus vincula rerums Laxet, & ingens pateat tellus, Typhifg, novos detegat orbes, Nec fit terris ultima Thule.

In after yeares shall Ages come, When th'Ocean shall vnloose the bands Of things, and shew vast ample lands; New Worlds by Sea-men shall be found, Nor Thale be the years bound.

Another reason to proue the Earth to be greater in quantity, may be drawn from the mixture of Earth and Water: for if these two Elements should meet in the same quantity, & challenge an equality; questionlesse the whole Earth would proue ouer moist, slymie, and vnapt for habitation. Which any man may easily obserue by his own experience. For let a portion of Earth, & another of Water be mixt together in the same quantity, the whole masse will seem no other then a heap of mire or slime, without any solid or consisting substance. Moreouer the water being no other then a thin and sluid body, hardly con-Degen. Taining it self within its own bounds or limits (as Aristotle tea-cer.

cheth vs) must needs require a hard and solid body, whereon to support it selfe, which body must of necessary be greater in quantity.

2 The Earth and Water together make one

Spheare.

It may be probably collected from fundry places of holy Scripture, that in the first Creation, the furface of the Earth; being round and vniforme, was ouer-whelmed and compass'd round with Waters, as yet vofurnished of living Creatures. Secondly, it appeares that Almighey GOD afterwards made a separation betwixt the Waters and Dry Land. This separation (as farre as reason may be admitted as Judge) seemes to be effected one of these two wayes: Either by giving super-natural bounds and limits vnto the Waters; not fuffring them to invade the Dry land; or els by altering the superficies of the Earth, cafling it into inequall parts, so that some-where, some parts of it being taken away, empty channels or concavities might be left to receive the Waters; other-where by heaping up the parts fo taken away, whence were caused Mountaines and eminent places on the Earth . The former of these wayes seemes altogether improbable; forafmuch as it is very vnlikely to imagine, that God in the first institution of Nature, should impose a perpetuall violence vpon Nature, as hereafter in place more convenient shalbe demonstrated. Wherefore taking the later as more consonant to reason; we shall find that the Water & the Earth separated and divided, make not two separate and distetin Globes, but one and the same Spheare; for a smuch as the concavities and hollow gapings of the Earth, are enery-where choaked and filled vp with Water, whole superficies is Sphæricall; & therefore helpes, together with the Earth, to accomplish and perfect this Terreft iall Stheare. To confirme which opinion, these reasons out of common experience may be alleadged: The first is drawne from the parts of Earth and Water; For we may enery-where obserue, that a portion of Earth, and another of Water being let fall, will descend in the same right line toward the same center: whence we may euidently conclude, that the Earth

Earth & Water have one and the felf-same center of their motion, and by a confequence conspire to the composition of one and the felf-fame Spheare. Secondly, to a like Arch or force in the Heavens, is found answerable alike Arch in the Terrefriell Globe, whether it be measured by the Earth or Water: which could not happen, were they not accounted parts of the fame Spheare. The third reason may be drawn from the Ecclipse of the Moon, wherein the part of the Moon shadowed & obscured, is observed to be one Sphæricall or round figure. This shadow, by the confent of all Astronomers, is caused by the Terrestriall Spheare, interposed betwixt the Sun and the Moon, intercepting the Sun-beames, which should illuminate the Moon; & the shadowes imitate the opacous bodies, whence they arise: But in the Eccliple we find only the shadow of one body or Spheare, and therefore according to the ground of the Opticks. we may conclude the body wherof fuch a shadow proceedeth. to be but one and the felf-fame Spheare.

The Forme of the Terrestriall Spheare, is the naturall Harmony or order, arising

from the parts working together.

We ought here to remember what we faid before; that the Earth and the Water concurre together to make one Terrestriall Spheare: wherefore the whole being accounted one coacervated and collected Body, made of two other; we are not to expect an Internall, Effentiall, and Specificall Forme, fuch as Ari-Hotle recounts amongst the principles of a Naturall Body: but only fuch a one as in it telf is Externall and Accidentall; yet concurring (as it were) Effentially to the constitution of the Terrestriall Spheare, whose Fabrick and first composition, can not well be vinderstood without it. Some have imagined the whole Globe of the Earth to be informed with one Internall and Effentiall Forme; which opinion feemes to have much affinity with that of Plato's, concerning the Soule of the World: Not that Plato and his followers were so absurd to defend, that the World with all his parts was animated with a true vitall Soul, in the nature of a living Creature: but that all the members of

it were vnited together, quickned, and disposed by a certain Energeticall power or vertue, which had great refemblance and representation of the Soule of man. Which affertion seemes to be restored and embraced by our late Magnetical Philosothers, whose opinion we shall discusse and examine hereafter in place convenient. In the mean time, grounding our discourse on known principles; we can admit no other Forme in the Spheare of the Earth, then the mutual! Harmony, order, & concent of the parts, concurring together, and working the perfection and perpetuation of the whole. A fit resemblance whereof we may observe in an artificiall Clock, Mill, or such like great Engine, wherein every part duly performing its own office, there will arise and refult a natural! Harmony, which not vnaptly may be termed the Forme of the whole Engine. Why the World should not consist of an Internall and Essentiall Forme, fundry reasons have bin alleadged by our common Philof-phers: First, because Nature neuer attempteth any thing in vain, or without a determinate end; But the particular Formes of speciall Bodies (say these Philosophers) are sufficient for the vnity and conformation of this Terrestrial Globe: fo that to grant an vniuerfall Forme of the whole, were to multiply caufee without any necessity, and make Nature the Mother of superfluity, which to all Philosophers seemes most absurd. Secondly, if this were admitted; the whole Spheare of the Earth would be as one continuat Body, whose parts should (as it were) fuffer a fellow-feeling one of the other. Thirdly, it were a difficult matter to affigne, to what kind fuch a Forme might be reduced, whether Animate, or Inanimate. If Inanimate, whether it were simple, or compound. If Animate, whether Vegetatine, Sensitine, or Rationall; under the which are couched many great difficulties, as yet vndisclosed. Whether these reafons be of any great force to ouerthrow the aduerle opinion, I leave it to further inquiry: intending here a Geographicall, not a Thyficall Discourse.

CHAP. II.

Of the conformitie of parts in the constitution of the Terrestriall Spheare.

Notine former wee have treated of the Naturall constitution of the Terrestrial Spheare, as well in Matter as Forme It is needfull in the next place to treat of such Affections and proprieties as necessarily arrise out of such a Constitution.

Those Affections or Proprieties are of two forts, Reall or Imaginarie: Reall I call such as agree to the Terrestriall Globe by Nature: Imaginary, such as agree to it by vertue of our vnderstanding.

Againe the Affections Really or Naturally agreeing to the Terrene Spheare, are affigened either in respect of the Earth it selfe, or in respect of the Heavens.

4 These Affections are said to agree to the Earth in respect of it selfe, which may bee expressed and understood without any comparing of it with the celestial Bodies.

These againe are twofold; either Elementarie, or Magneticall. Elementarie I terme

B 3 fuch

observed by ordinary Philosophers. Here is chiefly to be considered the conformity of the Terrestrial parts, in the making and constitution of the whole Spheare.

In the former Chapter we have shewed, that the Forme of the Terrestrial Spheare, is nothing els but the concinnity and apt conspiration of the parts whereof the whole is compounded. This conformity being divers and manifold, as well in regard of the parts conforming themselves, as the manner; of the conformity, we shall particularly and distinctly treat of, so far as appertaines to a Cosmographer. Here by the way I can not but taxe some defect in most of our common Comperaphers, who taking the Spharicall roundnes of the Earth for a granted Supposition, are nothing curious to search into the first grounds and causes of this rotundity, whereby it first became a globous Body; and afterwards retaines in it felfe a Naturall vigour or power (if any violence should be offered) to restore her self to her former right and perfection. All which are very pleasant & profitable, to give an industrious Learner some satisfaction. To explaine this before we descend to particulars, we will lay this ground and Theoreme;

The parts of the Terrestriall Spheare, doe naturally conforme and dispose themselves, as well to the production and generation, as to the

continuance and prescruation of it.

The forme of the Terrestriall Spheare, albeit (as we have shewed) it be Externall in respect of the whole Globe: yet may we call it naturall; for a sit iffered and ariseth from the naturall disposition and inclination of all the parts. To vnderstand which clause the better, we are to cosider that a thing may be called Naturall two manner of wayes: first in regard of the primary intent of Nature; as the nearest and immediate

end or scope to which she is directed. Secondly, in respect of her fecondary intent or purpose, as that which must of necessity follow the former. True it is that every Terrene Body, according to Natures first intention, seeks and works it's owne perfection and conferuation. Neuertheleffe according to her feenndary Intent, it concurres to the perfection and good of the whole vniuerle; which we shall plainely see in a stone or clodd of earth; which separated and removed from it's mother, the Spheare of the Earth, by his descent and falling downewards, feeks first his owne conservation, by reuniting it selfe to the Farth whence it was taken: Secondly, of the whole Globe of the Earth, which by this vnion and addition, no doubt, is made more compleat and perfect. This conformity of the Terrestriall parts, out of which ariseth the Earths Spharicity; I call the naturall inclination they have to move & fettle themselves in such a lite or polition, as may bring forth a Spharicall confiftency: fo that if it were possible (as what cannot be to Gods Almighty power?) that the whole Globe of the earth were diffolued and rent into little preces; yet were that vigor and motiue inclination remaining in the parts, whereby they might fettle and conforme themselves to the same spharicall nature, and composition which it formerly enjoyed. For all the parts thus supposed to be distracted, would (no question) meet together & conform themselues to the same point or Center; and so equally poising themselues, would restore the same Spheare so dissolved. So that we here note a double inclination and motion of earthly. bodies; first by a Right line, of the parts tending towards the Center; the other Sphericall of the whole Spheare, whereof the first in nature precedes the composition of the Spheare, the other followes. But this latter motion I leave doubtful, till place convenient.

The conformity of the Terrene parts is twofold, Primarie, or Secondarie. The former is that whereby all earthly bodies are by a right line carried and directed to the Cen-

terofthe Terrestriall Globe.

As in an Artificial Spheare or circle, drawne by a Geometrician, their principall parts are expressed, to wit, the Center, Ray, and circumference: so in the Naturall Globe of the Earth, these three, as it were Naturally & Really discouer themselves vnto vs. For first there is set a fixt point, to which all heavy bodies move and conforme themselves. Secondly, there is set the line or Radius, in which such bodies are carried and conveyed. Thirdly, the confluence of all these parts, begets the roundnesse and Sphæricall forme. To beginness with that which is first in mature, we will take these grounds.

1 All Earthly Bodies incline and approach to the Center as neere as they can.

This proposition so farre forth as it concernes the two Elements of Earth and Water, is confirmed by commonexperience, and therefore needs no long demonstration. For we see plainly, that not only these two doe incline (as much as may be, all obstacles being removed) to the Center of the Earth; but also all mixt bodies compounded of them, being overswayed with the most predominant element, to challenge to themselves the same motion. I fay not that all these Terrestriall bodies drive & meet in the Center (for that were impossible, that all this massy Spheare should be contracted to one point) but that all the parts haue a mutuall inclination to approach as neere the Center; as the necessity of the place, and the concurrence of them amongst themselves will suffer. By these Terrestrial Bodies which inioge this motion & inclination, we understand firat the two Elements of Earth and Water, with all other bodies arising out of their mixture. To these I may adde the Arre, which by reason of his affinity with the Earth and Water, and naturall conformity to the same Center, we may well tearme an earthly body. It is commonly reported that the Ayre is light, and therefore carried vpwards, not inchning at all to the Center of the Terrestrial Globe; as the parts of these two Elements are. But this affertion, although bolffred vp, both with antiquity and authority; I take either to bee falle, or misvnderstood,

and

and that I speake no more herein then I can proue; I will produce some reasons (strong enough, as I thinke) to perswade that the Ayre is a heavy body, having a due inclination and conformity to the Center of the Earth: First therefore will I produce this experiment. When a Well or deepe Trench is digged up in the earth, I would willingly demand whether the Aire descends to fill vp this Trench or concauity; or else a void space is left vnfurnished of any natural body to fill it? If they admit the latter, they wil confequently bring in againe that vacuum, or void space which Arist and all found Philosophers have long fince proscribed the confines of nature. If they affirme the former, that the Ayre descends to fill vp this empty space, I will aske againe, whether this descent of the Ayre be violent or naturall: If they fay Naturall, they admit our affertion, that the Ayre naturally descends towards the Center, and so by consequence that it is heavy and not light by nature. Neither according to our Peripateticall Philosophy can wee ascribe more then one motion to the Aire, because it is a ground generally receased among Aristoteleans: that One simple body can claime but one simple motion: much lesse one simple forme, as that of the Aire. can produce two opposite and contrary motions, such as are Ascent & Descent of the same body. If they chance to light on the other member of our distinction, and say that the motion of the Aire in this fort is violent, it must needs follow, that it must have some externall cause or principle whence it should proceed; because all such motions proceed from externall causes. But here no such cause can be affigned: For the cause would be either the Earth which is fo made hollow, or the emprinesse, or vacuum, or at least the other parts of the Aire. That it is not the Earth, may be proued; first because no Philosopher hath ever shewed any such Attractive power to reside in the Earth, but rather the contrary; because the Earth and Ayre by most haue beene thought opposite in nature, and repugnant ene to the other. Secondly, because Philosophy teacheth, that no agent can worke vpon a separate and distinct patient, except there be a meeting of the Agent and Patient in some meane. But here in this supposition, the Earth is imagined to drawe and attract

the Aire, which as yet it toucheth nor. That this externall cause is not the Vacuum or Emp. ineffe, is plaine; because it was never granted to have any being or existence, much lesse any caufality in nature. Some perhaps will fay, that not the vacuums it felfe, but the enitation and avoiding it, is the cause of the motion. I deny not but this may in some fort bee interpreted a cause, but the doubt is not answered: For we sceke not a Finall but an Efficient cause; and a curious searcher into Nature, will hardly rest in a meere finali cause. For the finall cause, so farre forth as it is a cause preceding the effect, can no otherwise bee conceived then in the intention of the Agent: then must enquiry be made againe what the Agent should be, and so will the probleme rest vncleered. 1. Because one parcell of the Aire could not move another, except the same were first moved it selfe, and so a new Agent must of necessity be found out. 2 The Agent and the thing moued or Patient, ought to be two feparate and diffinct bodies: But the parts of the ayre meeting together, become one continuate body. No shift is there left for these Philosophers but one distinction, wherein they distinguish betwixt the Vniver fall & Speciall forme. The Aire, as they affirme, according to his Speciall forme, ascends vpward from the Center of the Earth: yet by the Vninerfall, for the confervation of the whole vniuerle, it may fometimes fuffer a contrary motion, as to mone downeward toward the Center. In which diffinction they suppose they have cut the throat of all contrary reasons. But who so vnderstands himselfe, shall finde it but as a weake reed, to hurt his hand which rests on it : for a fecondenguiry will be made, what this vniuerfal forme should be. For by it they understand of necessity either an Internall forme or Nature; or an Externall resultance and harmony of the parts, fuch as we have described in the first Chapter of the booke. If they understand this latter, it cannot any way bee a cause of this motion; because it followes and ariseth out of this motion concurring with the rest, & no way precedes it: whereas on the contrary part every cause is to goe before his effect: Secondly, this valuerfall forme or nature compared with the speciall, there would arise a Subordination, and not a Coordina-

tion, or opposition; forafmuch as the speciall is subordinate to the generall or vniuerfall. But subordinate causes can produce no other then subordinate effects. But here we see the effects or motions to be quite opposite the one to the other; inasmuch as the motion of Descent in the Aire (which they ascribe to the v. niuerfall forme) is cleane opposite to the motion of Ascent, ascribed to the special nature. Thirdly, these Philosophers vrgeing the necessity of Nature to preserve the valuerle, are much deceaued in the manner and meanes thereof. True it is that all Earthly and heavy bodies are directed and disposed to the confernation of the earthly Globe. But every fuch body (as wee haue shewed before) seekes first the safeguard and preservation of it selfe, and secondarily by the safeguard of it selfe the prefervation of the whole. For how can any part, when it neglects its owne safety, endeauour the preservation of the whole: fith the whole is but one compounded of many parts. And therefore can it not be avoided, but that the diforders and disharmony of one part, should prejudice and destroy the whole frame. If they turne to the other part, and grant this vniuerfall forme to bee Internall, many reasons stand opposite. For first I would demand, whether this vniuerfall forme bee simple or compounded. It cannot be simple, because it would alwaies produce one simple and vniforme effect: but experience hath taught the contrary; because we shall not alwaies finde the ayre to descend, but fometimes to move obliquely to the left or right hand, backward and forward; as when it enters into the house by a doore or windowe. On the other fide, i: cannot wel be called a compound forme; because all formes the more voicerfall they are, the more simple they are to be accounted : because the speciall includes more composition then the generall. Moreover, all compounded substances arise out of simples, which are to bee esteemed first in nature. Secondly, I would aske whether this vniuerfall forme be vna numero, the felfe fame individuall in all the parts and bodies; or diverse, according to the diversity of the faid Bodies. It cannot be one & the felfe same in all bodies. because, according to the opinion of Aristotle, the whole vniverse is not one continuate body composed of essentiall parts; but

but rather a heape or maffe collected and digefted out of many bodies. Secondly, the forme being thus one individuall, would be fingular or speciall, not vniuerfall. If they affirme that this forme is diverse according to the diversity of the bodyes, it cannot be the cause of this motion or descent in the Aire. For this motion(as they suppose) is destined and appointed to no other end, then to comfort Nature in her diffresse, when she stands in feare of rupture or dissolution. But how can this forme being bounded within the limits of the Aeriall superficies perceaue or feele this exigence of Nature in other Bodies? What soeuer they can fay in this, is altogether vncertaine, and not warranted by any found demonstration. A second reason for the natural defcent of the Aire, may be drawne from a possible supposition; from which we may enforce a true conclusion. Let vs suppose a portion of Aire by fome violence to be carried aboue his proper orbe; as for example, to the space which by our common Philosophers is ascribed to the Element of Fire, neere the concaue Superficies of the Moone, I would here demand whether this portion of Aire thus transposed would ascend higher, or descend lower, or rest still in the same place? It could not ascend higher; first because in this wife it should be moved farther out of his owne place, whereas according to the principles of Philosophie, all bodies transposed from their proper places, have an aptnesse or inclination to returne againe to their proper feats, and not to roue farther off. Secondly, this granted, the Aire should inuade the place of the fire and so the Elements Thould fuffer a confusion; which Aristotle holds absurd. Thirdly, there cannot be imagined in that higher or be any point or center, to which it should direct his motion; and therefore there is no fuch motion found, or it must be very irregular. If on the other fide it were granted, that fuch a portion of Aire fo separated, should descend; I aske again, whether they hold this motion naturall or violent: It cannot be a violent motion. because it is directed to his own naturall and proper place; and this motion in the Elements, is alwayes accounted naturall, Last of all, it cannot rest stil in the same place, because all bodies forced out of their places (all obttacles being removed) must needs

needs returne vnto their proper place. Wherefore no other starting hole is here left to our opposites, but that they grant a naturall motion, and so consequently yeeld to our affertion. A third reason may beere be drawne from the condensation of the Aire. It is a received opinion amongst most Philosophers, that the thinne and subtile parts of the Aire will naturally mount vpward; but the thicker and condenfated parts, pitch and fettle themselues downeward: Which observation, if it be true, will yeeld vs this conclusion, That the Aire is by nature heavy, and therefore moueth downward, toward the center of the Spharicall Globe of the Earth. Which I will demonstrate out of these Principles, I That that body, which by addition of parts or condensation, is made more heavy or ponderous, must needs have some weight in it selfe. This may easily appeare, because the mixture of lightnesse with heavinesse will not intend and encrease the ponderositie, but slacke and diminish it. For the chiefest thing which remits or duninisheth any quality, is the mixture of his contrary, as we see the quality of cold to be abated and weakned if it entertaine any mixture of heat: 2 The thickning or condensation of any body is made by addition and coaction of more parts into the same space or compasse. As if the Aire or any such like body were thickned, it would confine it felfe to a more narrow roome then before, and fo consequently the narrow roome would containe more parts then before. Out of which we conclude, that for a fmuch as many parts pressed together in the same space, make the whole masse more ponderous; these parts so pressed together, must needes have fome waight in themselves. Which may further be illustrated; because the intention of the quality commonly followes the condensation of the subject: Which may easily appeare in red hot iron, which burnes and scorcheth more then flame or coales; because every part hath more degrees of hear. Now where more parts are closely pressed together, the heat must needes be more feruent. I have dwelt longer on this subicet, because I would not seeme to broach a new opinion without sufficient reason. To conclude all, and come as neare the receiued opinion as I can; I will fay, that the Aire may be confidered two wayes; first absolutely in it selfe; secondly in comparison of heatier bodies, to wit, the Earth and Water. In the first sense I grant no absolute lightnesse in the Are; because out of his natural inclination, it tends as neare as it can to the center, as all other lower bodies. But if we consider it comparationly in respect of other heatier bodies, wee may call it light, that is, lesse heavy or ponderous. So that by lightnesse we vnderstand no absolute lightnesse, but a privation. The summe of all we have hitherto proued, is this; That all terrene bodies, as Earth, Water, Aire, and other mixt bodies which concurre to the composition of the Earthly Spheare, as neare as they can, settle and conforme themselves to the center of the Earth; which site or position of them to the center, is their true and naturall place, wherein they seeke their presentation.

- 2 Of two heavie Bodies striving for the same place, that alwayes prevaileth which is heaviest.
- 3 Hence it comes to passe that the Earth enioyes the lowest place, the next the Water, and the last the Aire.

The increment or increase of any effect, must necessarily arise from the greater vigour or efficacie of the efficient cause, as both Reason and Philosophie well teach. Now) as wee have shewed all heavie bodies naturally do descend downward, out of a naturall inclination they have to attaine the center: but where there is a greater weight or constipation of ponderous parts in the same masse, there must needes proceede a greater inclination: Supposing then the Earth, Water, and Aire, being three waighty bodies to incline and dispose themselves to their vettermost force to inclose and engirt the center of the Terrestriall Spheare; it must needes be that the Earth being the most compact and ponderous, must obtaine the preheminence; next to which succeedes the Water, then the Aire, being of all other

the least ponderous. Yet we deny not but the Water and Aire being fettled in this wife, are in their naturall places; which to understand, we must repeat what we faid before, that Nature hath a twofold intent on; the one primarie, the other fecondarie. Indeed if we consider Natures primary or special inclination in the bodies themselves, we shall finde them (as we said) immediatly directed to the center as neare as might bee : but the fecondary intent of Nature was, that the bodies should so settle and conforme themselves, as that each of them should obtaine a place according to his degree of massinesse and waight. Out of this may be answered a certaine objection which some haue produced to proue the Aire to be absolutely light in his owne nature. Experience teacheth vs (fay these men) that a bladder blowneyp with winde, or an empty barrell being by force kept vnder water; the force and obstacle omitted, will suddenly afcend to the top, and that a man ready to finke in the Water, will not fo eafily finke downe while he can hold his breath; all which effects they ascribe to no other cause, then the inclination of the Aire to moue vp wards from the center. But indeed this motion, howbeit agreeable to the vniuerfall nature and confishency of the Spheare, is notwithstanding in respect of the Aire it selfe, vnnaturall and violent; because this ascent of it is not caused by the forme of the Aire, but the interposition of a heavier body striving for the same place, and so reverberating it backe from the place, whereunto it tended. For here it is to be imagined, that the bladder or empty barrell drowned in the water, claimes and inioyes for the time that place or distance, which otherwise so much water should occupie; to wit, so many inches of feet from one fide to the other. No maruell then that obstacles removed, the Water being most ponderous and waighty, receives his own right; and (as it were) shoulders out the Aire, and violently drives it off to his owne habitation. Whence many have imagined that this motion is proper and naturall to the Aire, when of it feife it is meerely violent, and enforced by the interiection of another body more waighty & ponderous then it felfe,

7 In this conformity of the Terrestriall parts, two things are to be observed: 1 The center it selfe. 2 The parts which conforme themselves vnto it. The Center is an imaginary point in the midst of the Terrestriall Globe, to which all the parts are conformed.

The Fathers of the Mathematicall Sciences, have laboured to deriue all their doctrine from a point, as the first and most simple principle wheron al the rest depend. Not that they imagine a point to be any positive entity in it selfe; but because it is the first bound of magnitude, whence all terminated quantities take their originall. The first principle we may call it, not of naturall constitution, because a thousand points colle-Acd, could not be so compounded, 'as out of it should arise the least magnitude; for (as the Philosopher hath taught vs) centinuate and divisible things cannot be made out of such things as are meerely discontinuate and indivisible, but because it is the first Mathematicall principle or beginning of termination and figuration. This point, although it have every-where an vie in Geometrie, yet no-where more remarkeable then when it becomes the center of a circle; which center we ought not to imagine a meere Geometricall conceit, but fuch as findes ground in the Natural constitution of the Terrestrial Spheare. For seeing all terrene bodies are carried in a right line as by a Radius to one point, from euery part of the circumference; we may obferue a center as it were defigned and pointed out by Nature it felfe in the Globe: Some have herre distinguished betwixt a point Physicall, and a point Mathematicall, as allotting the former Latitude, and sensible existence; but making the other meerely Indivisiale. But if the matter be rightly understood, they are not two points, but all one, diftinguished onely by a divers name of corceit or confideration. For we confider first a point as it is existent in a sensible particular body, and so we cal

it Physicall. Secondly we abstract it from this or that body senfible; but alwayes concert it withall to be in some body, and in this fort we terme it Mathematicall: for the Mathematician abstracts not a Quantity or Quantitatine figne from all subjects; for so being an accident, hee should conceive it abstracted from its owne nature; but from this or that sensible body, as wood or ftone. Such a point ought we to imagine the center of the Earth to be, not participating of any latitude or magnitude, albeit exiftent in some magnitude. I am not ignorant that some Writers haue taken a Physicall point for a small and insensible magnitude, in which sense the Globe of the Earth is called the center of all heavenly motions. But this fense is very improper; and befides in this example is to be understood a point Opticall, as fuch as carries no tenfible or proportionable quantity in regard of the fight. Taking then the center of the Earth to beea point fixt in the middest of the Earthly Spheare, as we have described, we will further describe the nature of it in two Theoremes.

The center of the Earth is not an Attractiue, but a meere Respective point.

An Attractine point I terme that, which hath in it a vertue or power to draw and attract the Terrestriall parts or bodies, in such fort as the Loadstone bath a power to draw iron or steele. But a Respectine point is that, which the Bodies in their motions doe respect and conforme themselves vnto, as the bound or center to which their course is directed. Which may be illustrated by the directine operations of the Load-stone (which we shall hereafter handle) by which the Magneticall Index or needle pointerh directly Northward: not that in the North is fixed any Attractive vertue or operation, which might cause that effect; but because the Magnetical Instrument is directed towards such a point or center. That the Center of the earth hath no Attractive force, may be proved, I Because it cannot in any probability be thought that an Imaginary point having only a privatine Being & subsistence, should challenge to it felse any such operation. For all positive effects, proceed

out of positive causes, neither can it be imagined that this Attraction should grow out of a meere privation. Secondly, should this be granted, that the motio of Earthly parts should be from the Attractive vertue of the Center: it would follow necessarily, that this motion should not be Naturall, but violent: as proceeding from an externall cause, which all ancient and moderne Philosophers deny.

The same point is the center of Magnitude and waight in the Terrestrial Spheare.

That the same point in the Terren Globe, should make the center both of Magnitude and Waight, may sceme very plaine I Because wee are not to multiply things and Entities in our conceit, without any necessary consequence drawne from Nature or Reason, enforcing vs thereunto. But what reason could euer perswade any man, that the Earth had two Centers, the one of Waight, the other of Magnitude, but only a bare Imagination, without proofe or demonstratio. Secondly, if this were granted, that the Center of magnitude were removed fome distance from the other; then consequently would one part of the Earth ouer-poize the other in ponderofity, & fo the whole Spheare would either be shaken out of its place, or dissoluc it felfe into its first principles. Both of which being by experience contradicted, our affertion will stand fure and vindoubted. In the meane space, we deny not but that some litle difference may be admitted in regard of the vuequall parts of the Earth; but this must needes be so small and intensible as cannot bee calculated, or cause any alteration.

The Terrene parts conforming themselves to this center, may bee considered two wayes: either Absolutely, or Comparatively.

Absolutely, as every part is considered in it selse.

9. A terrestriall part considered in it selfe, vn. dergoes

dergoes the respect either of a Point or Magnitude; as a point, when any signe or point in it selfe is considered in regard of his conformity to the center.

A Point, albeit existing still in some magnitude (as we have shewed) may notwithstanding be abstracted from this or that body, as serving for the center of any body, whose naturall inclination and conformity to the vniuerfall center of the Earth, we may in the first place handle, as the Rule by which the motion and inclination of the whole magnitude ought to bee squared.

I Every point or center of awaightie body, is moued toward the center of the Terrestriall

Spheare by a right line.

A Right line is the measure and rule almost of all Naturall actions; which albeit it be familiar in almost every operation; yet most of all in the motion of the Earthly bodies tending to the center of the Earth. Why Nature in this kind should chefly affect a Right line, fundry reasons may be alleaged: 1 From the End which Nature doth propose it selfe, which is to produce the worke which shee intends, the readiest and shortest way; as Aristotle testifies of her in the 5 of his Metaphysickes. Now it is manifest that a Right line drawne betwixt the same points, is alwayes shortest, as Euclide shewes in his Elements; where hee demonstrates that two fides of any triangle being counted together, are longer then the third. The better to vnderstand the working of Nature, we shall observe in the motion of a heavy part to the center, a double scope or end; first, that the faid part of a terrestriall body, should be moved or separated from the place to which it is by violence transposed. Secondly, that this body should bee restored home, and vnited to the Spharicall substance of the Earth, in which it must chiefly seeke its preservation That these two ends are best and soonest compassed by a right line is most manifest; For first a fepaparation from the place to which it is moued, is more quick & expedient by a right line; foras nuch as crooked and circular lines, turne backe as it were into themselves againe. Also the vpion and conjunction of a part with the Spheare of the Earth is most indebted to a right motion, because (as we have declared) the way is shorter. Secondly, it may be alleaged, that Nature is an uniforme and necessary Agent, restrained to one only bound or end, and therefore can neither fliengthen, weaken, remit or suspend the action, but workes alwayes by the same meanes, the same effects; whence it is that she chuseth a right line, being but one betwixt two points; whereas crooked lines may bee drawne infinite, and the motion directed by crooked lines would proue various and opposite to the prescript of Nature. Moreover should we imagine that nature at any time wrought by a crocked or circular line, it might be demanded, from what Agent this obliquity should arise? not from Nature it selfe:because (as we said) shee workerh alwayes to the vtmost of her strength, having no power to remit or suspend her actions. But a crooked motion ariseth from the remittion or flacking of the Agents force, and turning it away from the intended end, which onely findes place in Free and voluntary Agents. Neither comes this Deflexion from the medium, or Aire, because it can have no fuch power to refift. Thirdly, if the motion were not performed in a right line, it could have no opposite or contrary; because (as Arift the teacheth) To a circular or crooked motion, no o. ther motion can be opposite or contrary in respect of the whole circle; but onely in regard of the Diameter, which is alwayes a right line. By this it is plaine, that a waighty point confidered in it felfe abitractly, cannot but be carried to the center in a right line: which right line, eally and Physically points out vnto vs a Rad us or Beame drawne from the center to the circumference. to shew that the God of Nature in composing the earthly globe, both observed and taught vs the vse of Geometrie.

eap +.

2 A point moving toward the Center, will move fwifter in the end, then in the beginning.

This hath bin plainely observed by experience, that a fione

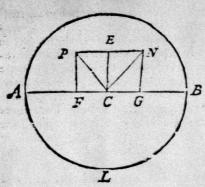
let fall from a towre or high place, will in motion grow fwifter and swifter, till it approach the ground or place whereon it falls. The reason may be given from the Aire, which refiss so much the lesse, by how much the body descendeth lower toward the Earth or center; because when it is higher, the distance being greater, the parts of the Aire will make more Resistance. The reason rendred by Aristoile of this Risistance, is, because in the beginning of the motion, the stone or heavy body findes the Aire quiet and fixed: but being once set on motion, the higher parts of the Aire, successively move those which are under, being driven by the violence of the stone so falling, and prepare, as it were, the way for his comming. This reason may in some fore content an ingenious wit, till a better be found out.

or center: it remaines that we treat next of the motions and conformity of Magnitudes to the center of the Earth: wherein wee consider not onely the Center or middle point, but the whole masse of the magnitude, whose motion and conformity shall be expressed in this Theoreme,

The motion of a magnitude toward the center, is not meerely naturall, but mixt with

a violent motion:

This may easily be demonstrated; because no point of any magnitude is moved to the Center naturally, but the middle point or center of the magnitude: For although the Center be moved in a perpendicular line, which makes right angles with the Horizon; yet the extreme parts are moved in lines paralled, which cannot possibly make right angles with the Horizon; er meet in the Center; which may bee showne in this Fi-



gure. Let there be a Circle as A B L. This done, we will imagine a certaine magnitude hanging in the Aire, and tending to the Center C, which is fignified by the line P E N. It is certain that the Center of the magnitude E, will moue and conforme it felfe downeward toward

the center of the Earth by the line E C, which motion will bee waterall, as that which is derived to a center from a circumference by the direct Radius, which is the Rule of all natural! motions: But the other parts without the center of this magnitude, cannot moue but in so many lines, which shall be paraltell the one to the other: as for example, the point N must needs moue in the line N G, and the point P in the line P F, which being of equall distance, will neuer concurre in the Center, and therefore cannot bee esteemed naturall rayes of the circle; whence we may collect, that the motion of these parts is not naturall, but violent: for if any should imagine the motion of these parts to be naturall, then should the point N moue to the center of the Earth by the line N C, and the point P by the line PC; and so by how much the more any waighty body should approach the Center of the Earth, by so much it should be diminished and curtailed in his quantity: so that in the Center it felfe, all the parts should concurre in an Indevisible point, which is absurd and contradicts all reason.

mity of all Earthly and waighty bodies to the Terrene center, as they are taken Absolutely. lutely. It now remaines that we speake of these bodies as they are taken comparativeby, being compared one with the other.

This discourse properly belongs to an art which is called Statick and is Mathematicall; whose office is to demonstrate the affections of Heavinesse and Lightnesse of all Bodies out of their causes. The chiefe sensible Instrument whereon these properties are demonstrated and shewne, is the Bilanx or Ballance. But these specialties were leave to such as have purposely written of this subject: amongst which the most ancient and chiefe is Archimedes, whose heavenly wit overtooke all such as went before him, and out-went all such as followed. Enough it will seeme in this Treatise to insert a proposition or two Staticall, to shew the Conformity of two magnitudes, and their proper Center, moving downeward toward the Globe of the Earth, & it's Center.

The lines wherein the centers of two heavy bodies are moved downeward, being continued, willmeet in the Center of the Earth.

A heavy point or Center (as we have demonstrated heretofore in this Chapter) is moved toward the Center of the world
in a right line, which is imagined to bee a Ray of the whole
Spheare derived from the circumference to the Center, & therefore it is impossible they should be parallell or Equidistant,
but concurrent lines. But because the whole distance betwixt
vs and the Center is very great; it must needs happen that in a
small space the concurse of perpendicular lines is altogether infensible. For if two perpendicular or heavy points moved in a
line, should be distant one from the other the space of 10, a 100
or more seet; because this distance is very little in respect of the
semidiameter of the Earth: the angle of concurse must needs bee
very little, and by consequence those two rayes or lines, measuring the descent of two heavy Bodies, will seeme altogether

Equidistant. Yet that there is such a concurrence, Nature and

Reason will easily consent. Hence we may detect a popular ersour beleeved of the vulgar, that the walls of houses standing vpright are parallell and of equall distance; when contrariwite It is plaine that fuch walls are erected by a perpendicular, and measured by perpendicular lines, which being drawne out in length will meet in the Center of the Earth. The like may wee pronounce of a deepe Well, whose fides or wall are erected perpendicularly; and therefore should it reach as farre as the Center, it must needs follow that the sides growing neerer and neerer as they approach the Center, would in the end close or shut vp into a Pyramide, whose Base should beethe mouth of the Well. Likewise if a Tower should be erected to the Heauens, ic would be ftrange to imagine, how great and broad the vpper part of it would be in respect of the bottom . Hence againe it may be inferred, that any pauement leuelled by a perpendicular is not an absolute plain, but rather the portio or Arch of a Spharicall superficies, whose Center is the same with the Center of the whole Earth. But this roundnesse in a small distance is no way sensible; but in a great pauement of soure or fine hundred paces leuclied perpendicularly; it will make some shewe of roundnesse: whence it must needs follow, that an extraordinary great pauement measured ouer by a right line, cannot be called levell or equally poized, for a much as it is not every where equally diffant from the Center of the Earthly Globe.

2 Two heavy bodies of the same figure and matter, whether Equall or Vnæquall, will in a-

quall time moue m an equall space.

This proposition being invented by one Ishannes Baptist de Benedictis, is cited and confirmed by Ishn Dee, in his Mathematicall Preface to Billing slie's Geometry. Which corrects a common errour of those men, which suppose the lighter bodies generally not to move so fast downward to the Center as the heavy. The demonstration of this Theoreme, being drawne from many Staticall principles, which we cannot here conveniently insert, we are ensorted to omis; as intending not the search of these matters any farther then they direct anto the knowledge

of Geographie. Yet were it no hard matter to glue a more popular expression of this reason out of the proportion betwist this weight of the heavy Body, and the Resistance of the Medium. Because the Greater Body, as it is curried down ward by a greater force and violence; so on the other side it meets a greater impediment, being not able to some to divide the Aire, as the Lesser: Likewise the Lesser body falling with lesse force, yet is more apt to divide it then the other. Whence both set the one against the other, there wilbe no disparity in the time and motion.

ftrial bodies in the constitution of the Terrestrial Spheare, we have treated: It now seemes needfull that wee descend to the secondary, which is the inclination of all the parts, to make a round Spheare or Globe.

The Terrestrial Globe is round and Spheare.

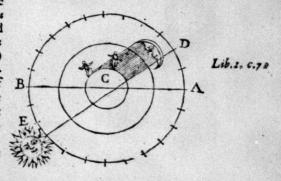
The Terrestriall Globe is round and Sphericall.

This Proposition is of great vse, and one of the chiefest grounds in Geographie. The ground of the Spharicall figure of the Earth, is the right motion of heavy bodies to the center. For this right motion (as we hate shewed) doth expresse one Beame of the circle, by whose circumvolution is produced the circumference of it, which we call Secondary conformitie of the parts of the Earth; infomuch as it growes Mathematically (as it were) out of the first. For this Spharicall figure of the Earth, fundry found realons are viged by Geographers: First, that the Earth is round according to its Latitude, that is, from North to South Secondly, according to its Longitude, that is, from East to West, and therefore must it needes bee absolutely Sphæricall. The first part is shewed, that it is round from North to South; for if a man trauell from North to South, or contrariwise from South to North, he shall perceive new starres in the Heauens to appeare and she w themselves, which before he

Sparicall convexitie, or swelling of the Earth. As for example; The starre which is called Canopus, which is a notable starre in the Thip; appeares not at Rhodes, or at least from high places. But if you travell forth Southward from Italy into Egypt, to L. de Bhar. Alexandria, the same starre (Prostus observes) will manifest it felfe to your fight the fourth part of a figne about the Horizon, From whence wee may draw a found proofe, that there is a Sphæricall and gibbous convexitie, which interpofeth it felfe betwixt Rhodes and Egypt. In which place, the people which inhabite that part of Egypt, which borders vpon Arabia, which are called Troplodites, of their dwelling in caues, cannot fee any Starre of the Great Beare. Whence we may conclude that the Earth from the North to the South, is round and Spharicall. For if other wife the Earth were plaine, all the Northerne starres would appeare to the inhabitants of the Southerne Regions; & on the other fide, all the other Southerne constellations would be seene of the Northerne inhabitants, which sense and reason altogether contradict. Secondly, that the Earth is round according to its Longitude betwixt East and West, may be proued by two reasons. The first is taken from the rising and setting of the Sunne, Moone, and other Starres, forasmuch as all they doe not arise or set with all Nations at the same houres. For with the inhabitants of the East, the Sun-rising is sooner; with the Westerne inhabitants later; and that in such proportion, that enery 15 degrees measured out by the Sunnes diurnall motion, adds or subtracts one whole houre in the length of the day. This is found by experience and testimony of Cosmographers. that the Sunne rifeth with the Persian, inhabiting toward the East, foure houres sooner then to the Spaniard in the West. Sundry other the like examples may be alleaged; all which we must needes impute to the Spharicall roundnesse of the Earth, proportionally increasing betwixt East and West. The other reason to confirme this last point, is drawne from the Ecclipses of the Sunne and Moone, which would not appeare in divers places, at divers houres, if the Earth were plaine or square. We fee plainly that Eccliples of the Moon apppeare fooner to the Westerne

Westerne people, but later to the Easterne. As (according to Ptolomie) in Arbela a towne of Asseria (where Alexander ouercame Darim the last King of the Persians) was there ob- Lib. 1 geog.
ferued an Ecclipse at the fifth houre of the night, which telse-cep. 4
same Ecclipse was seene in Carthage at the second- which to any man appears plainly in this figure here inserted. In like man-

ner an Ecclipse of the Sunne at Campania which was observed betwixt 8 and 9, was (as Pliny reports) seene in Armenia betwixt 10 and 11 of the clocke. Whence may be gathered that this difference of appearance arose from the roundnesse of the Earth, interposing it selfe betwixt these



two places. Another reason to prove the Spharicall figure of the Earth, is drawne from the Ecclipse of the Moone, wherein the obscured point is described by a Spharicall figure, which must needes argue, that the body which causeth the shadow, is alforound. For as the Optickes teach vs, the shadow is wont to follow and imitate the opacous body whence it proceedes, and all men confesse that the Ecclipse of the Moone is made by the interpolitio of the Spheare of the Earth betwixt the Sun & Moon, intercepting the beams of the Sam, which should illustrate & lighten the Moone. The third reason may be taken from the absurdaties which would follow, should we admit any other figure besides. For granting it to be plaine (as some of the Platewifts have imagined) it would necessarily follow in reason; I That the Elevation of the Pole would be the fame in all the parts of the Earth. 2 That there would be the same face and appearance of the Heauens in all places. 3 That the Sunne and Moone, with other starres, would in all places arise alike at the

fame houres. 4 That all Eccliples would appeare to all places at the fame houres. That the fame quantity of dayes & nights would bee at all places. 6 That the shadowes would be every where al ke; and one Region would not bee hotter or colder then ano her, all which would plainly fland opposite to recson and experience. As many or more would proue the abfurdities. of those, that ascribe to the Earth any other figure then Sphzrical!. Which I willingly passe ouer, as not willing to fight with shadowes, and faigne an opposition, where I scarce finde an adversarie. These reasons are sufficient to proue, that the whole masse of the Earth is Spharicall. Divers other popular arguments may be drawne from the finall cause to countenance this Affertion. For no other figure can be affigned to the Earth. which can more vphold the order of Nature, or speake the wisdome of the Omnipotent Creator. 1 Because such a Figure would best besceme the Earth, the seate and dwelling-place of all living Creatures, which is most capable: because otherwise the God of Nature would feeme to doe fomething in vaine, & without cause: For a smuch as the same capacity might be confined within Bricker bounds. Now it is apparant to all Mathematicians, that among ft all those figures which they call Ifoperimetrall, a Circle is the most capable, & amongst the rest, those which approach neerest vnto a circle. And as wee esteeme of a circle described in a plaine surface, so must we judge in solides of a Spheare. Which profitable Geometry of Nature wee shall finde instill'd into most living Creatures, who by a certain Naturall Instinct, without the vie of Reason, make their Nests and resting-places of a Sphericall Figure, as most convenient, and of greatest capacity; as experience shewes vs, in the Nests of Birds, and Bee-Hiues, wherein the cells are fashioned round & Sphæricall. 2 We shall find the Holy Scriptures confonant to this opinion in divers places; but that it might feeine impiety to vie those facred helpes in a matter out of controuerfie, and. needing no fuch Demonstration.

2 The rugged and unaquall parts of the Earth, binder not the Sphericall roundnesse of it.

It is thought by ignorant people, that the Farth is not roun because of the rugged and vneuen parts of the superficies of it: For tome-where it swells with great and high mountaines, rocks, and hills; Other-where it feemes indented, and as it were) trenched into valleyes, & concavities; all which feeme to detract from a true Sphæricall superficies; because in such a one e sery line drawne from the Center to it, should be æquall one to the other. Indeed that the Globe of the Earth is not Abfoliately and Geometrically round, as an Artificiall Spheare, is cof. fled by Eratofthenes, cited by Strabe in his 1 book of Geogra- Lib.1. phie: whence Pluy in his 2 book, cap 21: faith, that the Earth & Water make one Gobe, not so absolutely round as the Heauens, but much different, as also Strabo confirmes. This propofition depending on these 3 reasons which follow, will shew that this Inequality how great focuer it feeme to the fight, is altogether insensible, and bearing no proportion with the huge vastnesse of the whole Earth. The first is taken from the perpendicular hight of the greatest and highest mountaine, which is se'done or neuer found to exceed 10 miles, (although few Mathematicians will grant so much) whereas the whole Diameter of the Earth containes no lesse then 7200 English miles; fo that these hils compared to the thicknes of the Earth, are but as 10 to 7200: which indeed hath no fensible proportion. The fecond is taken from the Ecclipfe of the Moone, which being caused by the shadow of the interposed Earth, is described by a Spharicall figure, without any vnzquall or rugged parts. which no doubt, would appeare, if these parts challenge any due proportion, or sensible quantity, in respect of the whole Earth. Thirdly, some have illustrated this by a round bowle, or bail, whose externall furface, although unaquall, and indented here & there with fcotches, other-where fwelling with knobs. will notwithstanding being interposed betwixt the sun beame and a wall, or fuch place, give a round or Spharicall shadow in the same wall or plaine, in regard of the little quantity of these fmall parts in respect of the whole Body. In like fort must we imagine the mountaines and vinequall parts in the face of the Earth, to be no otherwise then as so many warts or pimples in tho.

the face of a man, which cannot alter his due proportion or symmetry of the parts.

3 The Water concurring with the Earth in the Globe is also Sphæricall.

It is a proposition agreed on by Archimedes, and almost all the ancient Mathematicians of any note, that the superficies of the Water, or any other liquor, standing and sublisting quietly of it selfe, is Spharicall; whose center will be the same with the center of the whole Earth, which we are here to handle, because it appertaines to the making vp of the Terrestrial Globes although wee shall have occasion hereafter to speake specially concerning the Water in Hydrographie, in the second part of this Treatife. The reasons to confirme this affertion, beside thole that in generall proue the Sphericity of the Terrene globe are divers: I It is observed that Paffengers in a Ship, lanching out into the deepe from some Hauen, will first perceiue the Towres, Buildings, Castles, Promontories, and Trees standing on the land, in their perfect figureand greatnesse: fayling farther off, they will observe them on the lower part, litle & litle diminished, vntill such time as the tops only of the houses and trees will be visible. In like fort they which tarry on the Land, will first espye the top and mast of a Ship approaching, which fight will be perfected more and more, as the Ship drawes toward the land, and at last all parts of it will shew themselves; which accident can be cast vpon no other cause, then the Spha-

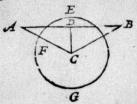


rical rounduesse, and swelling of the water; which, if the diffance be great, interposeth it selfe betweene the station on the Land and the Ship wherein Passengers are conveyed, which experiment is expressed in this Diagramme here annexed. Certaine Platonicks, of which the chiefest is Patricing a late Writer, would ascribe this

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this experiment to the impediment of the fight, eaufed partly by the distance which cannot perfectly represent the obicet, partly by the interposed vapours arising in the Sea; partly by the quivering light which is spread by the refraction of the Sun-beames in the water. I deny not but these causes may somewhat hinder, and cause that the true and perfect species of a body cannot alwaies wifit the fight. Yet will it be enident that this is not all, but that the Spharicall roundnes of the water will proue a greater impediment where the distance is any thing greater. But for one of Patrician his flufts concerning vapours arising out of the Sea, (to which Clavius seemes also to consent in his Commentary vpon Iohannes de Sacroboseo) it. makes more for our affertion then his. For that which is feen in a thick medium, according to the doctrine of the Opticks, feems greater in quantity, and by confequence neerer, and to higher then would otherwise appeare: as we see by experience, that the Sunne sometimes is seene of vs before it ascend about the Horizon, because of a refraction of it's beames in a thicke matter. Wherefore it were rather to be imagined, that a tower feen at Sea, or a ship from the land, through these thicke and grosse vapours, should appeare higher, and seeme neerer then if it met not with fuch vapours. Secondly, what is viged concerning the trembling light, caused by a refraction of the Sun-beames in the water, is of no force: For although fuch a light might cause an impediment or hinderance to the fight; yet would not this decrement or hinderance bee by degrees and in fuch proportion as we find it to be corespondent, to wit, to the distance interposed. And much wonder it is that Patricius (as my learned Friend Mr R. Hues obserues being, as it seemes very well read in the stories of Spanish nauigations, should not be consinced out of the Nauigation of Magellane, who taking his journey toward the Southwest parts , passed by the Magellane straights, now called by his name, and so returned by the Cape of Good Hepe into Spaine, to which we may adde the voiages of Drake, Candill, and many others. The fecond reason is viged by Aristotle in his 2d book de ealo, and hath its ground in Archimedes lib. s. de Aqua-vectis, which is formed in this.

fort. The nature of the water is to affect and flow to the lower place, whence it must necessarily be inferred that it must bee round, for otherwise it should not alwaies obtaine the lower place. The reason of the consequence shall be expressed in this



figure; for it we afcribe to the water a plain superficies, let it for example be AD B, and from the center of the earth C. let there be described a circle, to wit, EGF, then let there be drawne CD, a perpendicular line to AB, and let AC and BC be joyned together. Now be-

cause the right line CD is lesse then CA, or CB, as wil appeare evidently by sense; it will be plaine that the point D will be in a lower place then the point A or B, because D is nearer to the Center; forasmuch as D C is but a part of a beame of the circle whereas A C and CB enidently exceed that quantity or proportion. Another reason there is, commonly drawne from the roundnes of drops cast on the land, as also from water in pots. whole superficies seemes to swell about the brimmes; but this reason, as we shall proue in place convenient, is rather against this affertion then for it; because indeed, wee affirme the water to be round, but fo as it claimes the fame Center with the Center of the Terrene Globe: and therefore cannot be sensible in so little a portion, as a drop, or pot of water. This propolition being sufficiently proued by these two reasons; it is needfull in the second place that we answere certaine obiections cast in by the faid Patricins against our affertion. Euery surface of the water (quoth Patricius) is either only plaine, or only round, or both plaine and round, or neither plaine nor round: First that it is not both plaine and round, feemes very evident, for fo it should admit of contrariety: Neither can one part be plaine and another round, because the water is an uniforme and homogeneall body, not confifting of fuch vnequall parts: that it should neither be plaine nor round seemes more impossible, because few or none have dreamt of any other figure. Lastly, that it is not round only he labours to confirme by fundry reafons

fons and experiments. First, he testifies of himself, that fayling in the Sea, he plainly faw in the morning before Sun rifing, the Mountaines of Corfica: which afterward, offoone as the Sunne was rifen vanished out of his fight. Whence he conclude , that this proceedes not from the roundnes of the Farth, but from fome other cause. But this argument to indictous men wil frem very weake. I Because it depends altogether on the authority and credit of Patricius, whose affertion I take to be no better then another mans denial. 21 were this argument enery-where found, yet would it proue no other thing, but that this effect were not to bee imputed to the Spharicall swelling of the Earth. Whence cannot be drawne any generall conclusion, that the Earth or Water is not Sphericall. We deny not in the meane time, that other causes sometimes concurre, which may hinder or take away the fight of objects from those which faile on the Sea. The second experiment, Patricins describes in this manner. At a certaine Towne called Comaclum (faith hee) there is a very great poole; through which poole or lake fome 3 yeares agoe, it was my chance to be carried in a boat. The bottome of the water almost all the way in all the journey appeared to be leffe then 2 foot in depth from the top. The way increasing, at first the lower parts and foundations of houses, then the tops and princely pinnacles began to vanish from our fight: at last having scarce passed 6000 paces, a Tower 72 foot high began to appeare, as it were cut off by the middle, & from the middle part vpward appeared visible; but after 10000 paces it was taken out of fight: I would here aske the Geographers (quoth Patricius) whether in so short a distance, wherein the bottome for the whole space surpassed not two foot in depth, the water could ascend to 72 foot ? Had it bin my chance to have gone with Patricius ouer the lake, I might perhaps by observation of this experiment, have given a more probable coniccture of the cause. Neuerthelesse being vnacquainted as well with the place, as the truth of his observation, I may perhappes guesse somewhat at his errour. First then, whereas he averres, that passing along for the space of a 1000 paces, a Towre of 72 took high, seemed cut off by the midst, which at 10000 vanished SUS

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out of fight. I confesse that in fo short a space the swelling of the water inter-posed, could not be so great as to hinder the fight, and be the cause of this effect: wherefore some other Acsidental cause must be sought out. For the finding out of which to come as neare as I can, I would make inquiry, whether this passage of the Boat was directly forward from the Towie on the Water, no land inter-posed: or Indirectly side-wise, in such fort, as the shore might be placed betwixt their fight and the Towre mentioned: The former no wayes can be imagin'd; foralmuch as it not only contradicts the grounds of our received Thilosophie; but also of Patricius himselfe: for giving the Earth a plaine surface, or Angular, or any other forme, it were impossible that in fo short a distance, such an effect should happen out of the figurature of the water. If the passage were oblique or indirect, in such wise as the shoare might any way inter-pose it selfe betwixt the Boate and the Towre, it were easie to imagine how fuch an experiment should happen; for the land by which the Boat might be carried, might have an afcent by fuch Degrees, as the Towre at 1000 paces might be for the halfe of it obscured, and at last be al ogether taken out of fight. This reason then of Patricius, seemes rather to be ascribed to the Land then the Water. The third reason of Patricins is drawne from the Homogeneity of the Water. If the water (faith he) have a round superficies, the parts of it would challenge the like figure, because in homogeneall bodies, the same reason is to be given of the whole, and of the parts: But the parts of the water are not Sphæricall, as may be proued by divers instances: I Because water in the mouth of a por, seemes not to have any such Spha. ricall roundnes: for although at the brinke it feeme to bee restrained about the pot, yet no such swelling appeares in the middle. 21 That rivers are kept in by their bankes, which otherwife would flow abroad. 317 That rivers, when by the melting of fnow, they swell so great, as they can hardly be contained within their bankes, doe not seeme higher in the middle, then in other places. 414 If any man from one fide of the river to the other, levels at any mark, he may furely hit it: which he Chouldnot doe, if there were any Sphæricall swelling in the midft,

midit, which might hinder the fight. 514 and laftly it feemes fo valikely that the water should rife in the midst, that it is more probable it should be more hollow; in that we plainly observe that all filth and rubbish carried from the bankes into the ruer. is wont to fettle and swimme in the midst. Notwithstanding all these arguments of Patricius, our ground is vet vnshaken; I Concerning finall drops, and water in the mouth of pots; it is found to be round and Spharicall, though not exactly the reafon whereof we shall declare hereafter. This roundnesse, I confelle, ferues not any way to the confirmation of this affertion. because the Spharicity and roundnes which we averre to be in Water, hath for its center, the center of the whole Earth; and therefore in so small an arch or section, as the bredth of a pot, or a drop of water, cannot possibly haue any sensible appearance or existence. And we must needes confesse, that this experiment was very fondly vrged to this purpose by some of our Geographers, and fuch as stands not with any demonstration. Which granted, sufficiently answeres all the reasons last viged by Patricius, except the last. For a smuch as he requires in the Water, a sensible appearance of this roundnesse in euery river or litle parcell of water, which cannot be admitted. Touching the last thing which he vegeth, that all the rubbish and filthy matter, is from the bankes carried into the middle, whence he would inferre the middle to be hollow and lowest; we can anfwere divers wayes: I That this experiment is not alwayes certaine, because every man may oftentimes see the contrary; to wit, that such filthy rubbish rather vseth to cleave to the banks of the river, then to float into the midft. 214 That if any fuch thing happen, it is because of the torrents which run violently from the banks into the midft, carrying with it fuch things as are light, the steepnesse of the place being greater, the current wider or swifter. But nothing here can be concluded to proue the water according to his naturall force, to bee either plaine or hollow in the midft, which this Adversary undertook to demonstrate.

CHAP. 111.

Of the Partiall magneticall affections in the Spheare of the Earth.

I Haftedions of the Terrestriall Spheare as are Elementary, and knowne heretofore to ancient Philosophers: It follows in the next place that we treat of Magneticall affections, to wit, such as follow the magneticall nature of the Earth.

Of the verine and propriety of the Load-stone many have written, but few fought out the true nature. The invention of it is attributed to a certain heardf-man, who having his shooes shod with iron, and an iron pike in his hand, resting himselfe ona quarry of Loadstone, could hardly remove himselfe fro thence. But this feemes rather a pleafant Poeticall invention, then a true History, having no good Author to auducnit. But to let passe the first Invention, being a matter rather indebted to chance then industrie; no small difficulties have discovered themselves in the invention and finding out of the causes of Magneticall properties. Somewhat, I confesse, hath bin written of such magneticall affections as have bin most knowne; such as is the vertue Attractine, by which it drawes to it selfe iron, or steele; as also the vertue Directive, by which a needle touched with the Magnet, directs and conformes it felle North and South. The rest of Magnetical proprieties I find in ancient Writers, as litle knowne as their causes; & if any matter herein were broached, it was merely coniectural, and depending on no certain demon-Aration: neither had we any certain or fatisfactory knowledge

of this thing, vntill fuch time as it pleased God to raile vp one of our Countrymen D. Gilbert, who to his everlasting praise hath troden out a new path to Philosophie, and on the Load-Stone erected a large Trophie to commend him to posterity. This famous Doctor being as pregnant in witty apprehenfion, as dil gent in curious fearch of naturall causes : after many experiments, and long inquity, found the causes of most magneticall motions and proprieties hid in the magneticall temper and constitution of the Earth, & that the Earth it selfe was a meere Magneticall body challenging all those proprieties, and more then have expressed themselves in the Load-stone. Which opinion of his was no fooner broached, then it was embraced and wel-commed by many prime wits, aswell English as Forraine. Infomuch that it hath of late taken large root, and gotten much ground of our vulgar Philosophie: Not that in the maine scope and drift of it it contradicts or croffes all Peripateticall principles, or the most part of such grounds as haue hitherto borne the stampe aswell of Antiquity, as of Authority: But that it hath brought to light matters of no small moment, which neuer found any ground or footsteppes in our ordinary Philosophie. This new Philosophie I date not comend as euery-where perfect and absolute, being but of late yeares invented, and not ver brought to mature perfection: yet would it sauour of litle ingenuity or judgment in any man, peruerfely to deny all fuch Magneticall affections in the Earth as are grounded on plaine experiments and observation: fith no Philosophie was everyway so exact, but required experience dayly to correct it. I intend not here an absolute discourse of Magnetical Bodies and Motions, but leave it to their fearch whole experimentall industrie is more suteable to such a subject. Onely I will shew fome generall grounds appertaining to the constitution of the Terrefirial Globe, which I hold necessary for a Geographer. Wherefore ere I curionfly diffinguish these Magneticall proprieties of the Earth into other scuerall kindes, I will set down this Theoreme, as a ground or foundation of that which followes.

The Terrestriall Spheare is of a Magneticall nature and disposition.

A Magnetical Body by some is defined to be that which feated in the Aire, doth place it selfe in one place natural, not alterable. This fituation is supposed to agree to all the Starres, especially to the great Globes of Saturne, Inpiter, Mars, and the Sunne; as also to such as give their attendance on them, lately detected by the Trunk-spectacle; to wit, those two Starres which moue about Saturne, the foure which moue about Iupiter, the two which circle about the Sunne, as Venus and Mereurie; and lastly the Moone, which encompasseth the Spheare of the Earth. But to let passe those other Globes, as farther off. and therefore leffe subject to our search : our discourse shall onely touch the Earth whereon we liue, which we shall proue to partake of a certain Magneticall vertue or inclination; which to shew more openly, we must vnderstand, that all Magneticall Globes have some parts of their bodies which be also Magneticall, which being divorced from their proper Spheare, & meeting no obstacle, will settle themselves to the natural situation of their peculiar Orbes. Which we may plainly perceive in the Spheare of the Earth, wherein we shall find two Magnetical minerals; whereof the one is the Load stone, attracting iron or steele; the other the Iron or steele it selfereither of these two, artificially hanged in the Aire, or placed in a litle boat on the water, all incombrances being removed, will conforme and fettle their parts and Poles correspondent to the poles and parts of the Terrettriall Spheare, as North and South. This hath bin found in all parts of the Earth by fuch as have travelled round about her, as Drake and Candish, whose Compasses were alwayes directed Magnetically in all places which they paffed: which we cannot ascribe to any other cause then the disponent faculty of the Earth's Magneticall Spheare, as shall appeare hereafter by demonstration. Moreouer it hath bin observed by such as saile Northerly and Southerly, that the Magnetical Inclinatory necdle, in every elevation of the Pole is conformed and disposed to the Axell of the Earth, according to certaine angles answerable

to the latitude of the Region, as we shall shew hereafter. This diversity of conformity must necessarily arise, either from the Magneticall instrument init selfe absolutely confidered, or els from the Harmony and correspondencie it hath with the Terrene Globe. It cannot be the first; because it should be the same in all places and Regions of the Earth, which is contrary to experience, and our supposition. Then must we needes deriue it from the Magneticall disponent vertue of the whole Globe of the Earth, from which vertue the whole Earth may be called Magneticall. Nay if we truely confider, these Magneticall affections primarily agree to the Earth, as the mother of all Magneticall bodies; but afterward secondarily are derived into the parts; because (as Gilbert relates it) the cause of magneticall motions and affections is the magneticall forme of a Spharicall Globe; which forme first agrees to the whole Globe of the Earth, and so is derived to all his bomogeneall parts. These parts are called Homogenzall, not in regard of their Matter and quantity, but in respect of their Magneticall nature and communion, which in every part is conspicuous. If any man should wonder why the Earth should be called Magneticall in regard of this minerall, which seemes one of the least and scarcest substances whereof it confifteth; we may many wayes answere : First, that although the furface of the Earth scemes for the most part composed of other materials, more convenient for the vse of huing Creatures which dwell therein: yet may infinite rocky mines of Magnets be couched lower toward the center, which ftrengthen and confolidate the Earthly Globe. Secondly, we must not imagine the Magneticall substance of the Earth, to be all one kind of stone, but various: for somewhere it is hard & solide as the true magnet it felfe and the iron, which is nothing els but a mettall decocted out of the Load-Stone; (for mon Oare differs litle or nothing at all from the Load-stone it telfe) somewhere againe, this substance is more thinne and fluid, being leffe concocted as some kinde of clay, and certaine vapours arifing out of the Earth, which be magneticall : which being brought to a harder and more miffie fubthance, will have the fame affections and motions with the Loadstone it selfe. This affertiaffertion of the Earth's magnetical nature, we shall confirme more enidently hereaster, where we shall proue both the Poles, the Meridians, Farallels, and other circles, to be not bare Imaginary lines, as some have thought (but to be Really grounded in the magnetical nature of the Earth, and are to be shewed in any round Loadstone, wrought and placed conveniently with instruments thereunto applyed.

2 The Magneticall affection of the Earth is twofold, either Radicall or Derived The Radicall disposition we call that which is the first root and ground of all other magneti-

call motions.

3 The Radicall vertue or inclination is again twofold, either Motime or Definent. The Motime is that by which all magneticall bodies are inclined and stirred up to the motion

In the Reasonable soule of a man, wee have two faculties which shew themselves; a movine, and a directione or disponent power:whereof the one firres vp the motion, the other regulates, conformes, and directs it: The former is the Will, the later the Discourse and Judgment. This distinction of faculties, howfocuer more euident in the foule, findes place in all Naturall agents: in which a Philosopher ought to distinguish betwixt that which gives them a power to move, and that which limits, determines, and (as the Schoolemen are wont to speake) modificates the action. Amongst others the magnet sone seemes most to partake of these two powers, as that which amongst all naturall agents (in Gilberts opinion) I emes most to have resemblance with the soule of a man: to that by an apt Trope it hath bin called of many, the Mag etical foule of the Earth; for hence we may well perceive one vertue or inclination, which causeth the magneticall needle to mode out of its place; another

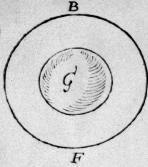
other by which it is apt to conforme it felle North and South, as also to observe certain angles correspondent to the latitude of the place, as shall be demonstrated in due place. Of the motive power we will produce these Theorems.

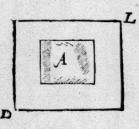
The Magneticall motion is excited in a small and conperceinable difference of time.

This proposition may be shewed out of euident experiment, wherein every mans fight may be a witnes. For if an Iron needle touched with the Loadstone, be placed within the Spheare of the magneticall vertue of the stone, it will presently move it felfe, norwithstanding the interposition of solide bodies, which made Gilbert to imagine this motion to be effected by a meete firituall and immaterial effluxe, which may well be compared to the light, which neverthelesse it surpasseth in subtility: fortie light is moved from East to West so quickly, insomuch as many haue thought this motion to haue bin in a moment or inflant of time. But this quicknes of motion may much more be imagined in the Magneticall vertue, being of a more fubtile and piercing nature, as may be gathered from this reason, to wit; That the light is alwayes hindered by the interpolition of a thick and epacous body; but the vertue Magneticall findes a passage through all solide bodies what soeuer; and meetes with no impediment.

2 This Motine qualitie is spharically spread through enery part of the Magneticall body.

Here againe may we finde a great refemblance betwirt the magneticall vertue and the light; for as all light Bodies, as the Sunne, Moone, and Starres, cast their beames every way into an orbicular forme: so this Magneticall vigour casts it selfe abroad not only from the center toward the superficies, but from the superficies outward into the Aire or Water, where this magneticall body is placed, and so makes vp a Spheare; but yet with this difference, that if the body be meere and perfectly Spharicall, the Orbe of the magneticall vertue will end in a perfect Spheare, as we see the magnet G to confine his vertue within



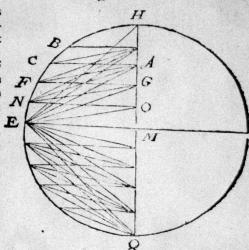


within the Circle B F. But if it be a square, or any other figure not Sphæricall, it imitaes a Spheare as neare as the body will suffer, in that it spreades it selfceuery-where from the center by right lines; yet will it be confined in a square figure correspondent to the body, whence it proceeds, as we see the vertue of the square magnet A, to cast his beames into the square figure LD.

3 The motive quality of the Magneticall body is strongest of all in the Poles, in other parts by so much the stronger by how much these parts are situated neare the Poles.

We suppose out of the principles of Magneticall Philosophie, that a Magnet hath two Poles, whose vie we shall shew hereafter. These Poles are found by experiment to have more force and vigour in them then other parts, and all other parts to enion more or lesse force, by how much nearer or farther off they are situated to their Poles. The reason is ascribed by these Writers to the disposition of the Magneticall vigour in the body of the Loadstone, as shall appeare by this figure following in Gil'ers, expressing the great Magneticall Body of the earth. Let the Spharicall superficies of it be HQE, the Pole E, the Center M: HQ the plaine of the Equinoctiall; from every point of this Equinoctiall plaine, the vigour Magneticall is conveyed and extended to CFNE; and to every point from C to E the Pole; but not towards the point B, so neither from

G towards C. The vigour is not Arengthned in the part F HG, from that which is GMFE; N but F GE H doth increase the vertue in H: fo that there can arife no vigor fo far from the parallels to the Axel-tree boue the



faid parallels, but internally from the parallels to the Pole. So we see that from every point of the Aguinottiall plaine, the force is derived to the Pole E. But the point F hath onely the vigour from GH, and the point N from OH: but the Pole E is corroborated and strengthened from the whole plaine of the Equinoctiall HQ. Wherefore the vigour magneticall in this Pole is most eminent and remarkeable, but in the middle spaces; as for example in F, the magnetical quality is fo far strengthened, as the portion of the Equinoctiall plaine H, can give. But D' Ridley in his late Magneticall Treatife, in the 6 Chapt. feemes to oppose this Demonstration. For although hee acknowledgeth that the vigour is strongest of all in the Poles; yet (szithhe) if tryall bee made what the Pole will take perpendicularly; and also what the parts about 34 degrees will lift vp, it will appeare to be halfe as much perpendicularly; fo that the Pole doth not take vp as much, as this and the other part doth on the other fide. But the decision of these differences I leave to fuch as are more experimentall then my felfe, being defti-

- 4 It behoues vs in the second place to speake of the Disponent vigour of Magnetical bodies. The Disponent force we call, that facultie by which magnetical Bodies are disposed or directed to a certaine site or position.
 - 1. Magneticall bodies move not vncertainly, but have their motions directed and conformed to certaine bounds.

This Proposition is confirmed by manifold experiments. For magneticall bodies are neuer found to move uncertainly, & at all adventures, but conforme themselves to certaine Poles; and make certaine angles proportionall to the latitude, as we shall thew hereafter in particular. The reason of which experiment we can draw from no other cause, then the first institution of Nature in all Naturall agents, which she would have directed to certaine ends, that nothing in her Common-wealth might feeme idle or vnnecessary; wherefore she gives all agents not only a power to worke their ends; but also shewes them the may, Iquares and regulates the meanes which direct vnto the end. No-where is this directine power more remarkeable, then in magneticall bodies, especially in their Direction and Variation, motions treated of hereafter in place convenient; to which for a further confirmation of the Theoreme, wee referre the Reader.

body being somewhat spoken of, as well in their motiue, as disponent vertues. We are in the next place to speake of the deriued motions, which arise out of these faculties. These motions magneticall are either partiall, or totall. The partiall we call that by which the parts of the Earth are magnetically moued and conformed as well one to the other, as to the whole terrestriall globe.

7 The magneticall partiall motions are Coition, Direction, Variation, and Declination. Magneticall Coition is that motion by which magneticall bodies are joyned and apply themselves one to the other-

For the knowledge of this magneticall motion, we need goe no farther then the Iron and Steele, which we shall observe to moue vnto the Loadstone, and cleave vnto it, if so be it be placed within the Spheare of his vertue. This motion is commonly called Attraction, but improperly, as is observed by D. Gilbert. I Because Attraction seemes to suppose an externall force or violence, by which one thing is carried and moued vnto another: but the Coition is meerely naturall, as proceeding from the internall forme of both the bodies.2 Attraction supposeth the force of mouing to be onely in the one party, and the other to be meerely passiue, and not actively concurring to this motion; whereas in the magneticall coition, both parts are mutually inclined by nature to meet and joyne themselves one to the other. Not that the force of motion in both parts is alwayes equall: because one magneticall body is greater and stronger then the other, and then the one part seemes to stand still and draw the otherwnto it, although there be in this part fo refting an inclination to the other; which mutuall inclination of coniunction in magnets, we may eafily fee in two magnets of equal quantity and vertue, which being fer at a convenient distance, will fo moue, that they will meet in the mid way. Some have gone about to parallell this Attractive force of the Loadstone with the Attractive force of leat or Amber, which we fee by 2

naturall vertue to draw vnto it felfe litle strawes, and other fuch like matter. But he that truely vnderstands the nature of a magneticall body, sha'l finde a great disparity: First, because the leat or Amber which are comprised under the name of Ele-Urical bodies, drawes vnto it by reason of his Matter: whereas otherwise the cause of the Magneticall Coition is to bee fought in the forme, as being too fubtile a thing to fpring from a materiall substance. Secondly, Elettrical bodies draw and attract not without rubbing and flirring vp of the matter first; & presently faile, if any vapour or thick body should be interpofed, But in a magneticall motion we find no fuch matter, because it requires no such preparation or rubbing of the stone, nor is hindred by interpolition of folid bodies, as we proue in this place. Thirdly the Loadstone moues and prouokes to motion nothing els but other magnetical bodies; but the Electricall will draw any litle thing, as ftraw, haire, duft, and fuch like. Fourthly, the Magnet will lift a great waight according to his vertue and quantity; but leat the smallest and lightest things. Lastly, the Electrical bodies, as Gilbert well confirmes by experiments, draw other bodies vnto them by reason of a meist effluence of vapours, which hath a quality of joyning bodies together: as we fee by the example of two flickes in water at a certaine distance, which will commonly moue till they meet together. But the magneticall coition cannot be other then an act of the magneticall forme. Of the cause of it many Philosophers haue freely spent their vncertaine coniectures, rather out of a feare to be esteemed ignorant, then of confidence to be accounted learned. Most run vpon the forme of the mixt body, which growes from the composition of the foure Elements; but this opinion is very feeble, and cannot goe without crouches: for fith all mixt formes grow cut of the temperament and disposition; they adde nothing to the thing compounded, but diverfly modificate what was before in the simple Elements; it cannot bee imagined how fuch an affection as this should bee onely found in the magnet, & no other mixt body. Indeed we ascribe this affection to the forme as the immediate cause; but by this forme we understand not the forme of the mixture, resulting out of

of the mixture and temperature of the foure qualities; but the magneticall forme of all globous bodies, fuch as are the Sunne, Moone, Starres, and this Trrrestriall Spheare whereon we live, whose natures received the stampe in the first creation for the prescruation of this integrity. He that shall seeke for the originall of all formes of this kinde in the mixture and conflitution of the foure Elements, shall labour much, and finde litle, and neither at laft be able to content himfelfe, or instruct others; except we suppose a man sufficiently taught when he heares ordinary matters expressed in exoticke and artificiall termes. For my owne part, I content my felf with a rule of Biel the Schoolman; That when an immediate effect proceedes from an immediate cause, we ought not to search farther why such a cause should produce such an effect. Euery man being demaunded why the fire is bot, is ready to flye to the forme of fire, and alleage this as the cause: but should be inquire further, why the forme of fire should be the cause of hear, he might perhappes puzzell a whole Academie of Philosophers, and neuer proue himselfe the wifer. For the further illustration of this motion, these Theoremes will seeme necessary.

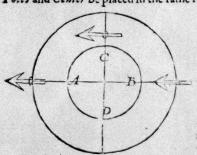
The Magnet communicates his vertue to iron or steele if it be touched with it.

Experience teacheth that any iron instrument, touched with the Loadstone, receives instantly the same vertue Attractive. But the manner how this vertue should be communicated on so sleight a touch, hath bin controverted. The common Philosophers have imagined, that certain lirtle parts of the Loadstone are separated from it in the touch, which cleaving to the iron or steele cause this Attraction. But that this vertue cannot be communicated by any corporal processe, or any such little parts cleaving to the iron, is not so easie to imagine for first it seems impossible, that with a bare touch, these parts should be separated from the magnet, or at least should bee so fast linked to the iron. Secondly, these parts being so little and insensible, cannot have so much vigour as wee see an Iron will have at the touch of the Loadstone. Thirdly, the Loadstone can worke vpo

the iron notwithstanding any body interposed, which is an euident signe that the iron it selfe is of a magnetical temper. Wherefore to shew a reason of this effect, we say: That Iron is a mettall excosted out of the Loadstone; which albeit it retains in it selfe the vertue of the Loadstone, yet by reason of the liquesaction, is altogether languishing, and as it were buried; but you touch of a Loadstone, is stirred up to his former vigour; for the magnet insunats his Incorporeal instruction the iron, and so rectifies and animates that force which was almost dead.

2 The magneticall Coition is strongest of all in the Poles.

This may easily be demonstrated by an experiment: for if the iron needle which is proposed to bee Attrasted, and the Poles and Center be placed in the same right line; then this Coi-



tion will be to a perpendicular, as in A and B, to wit, the Poles in the Diagramme: but in the middle space they will obliquely respect and point: and by how much farther off from the Pole it is, by so much is this vertue weaker: but in the Agnator it selse it be-

comes meerely parallel without any inclination at all. To know in what proportion this force is increased or weakned, we must put another ground; That the force of this coition is increased proportionally as the chords of a circle: for by how much the least chorde in a circle differs from the Diameter, so much the forces Attractive differs from themselves. For such the Attraction is a Coition of one body with another, and magneticall bodies are carried by a sonvertible nature: it comes to passe that a line drawne from one Pole to another in the diameter, direct-

ly meetes with the body, but in other places leffe, fo that the leffe it is converted to the body, the leffe and weaker will be the coition.

8 So much be spoken of the magneticall Coition: It followes that we speake of Magneticall Direction, which is a naturall conversion & conformity of the magneticall bodies to the Poles of the Earth.

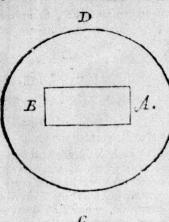
It is manifest that a magneticall body so seated, that it can more without any impediment, will turne it selfe in such wise, that the one Pole of it will respect the North Pole of the Earth, the other the South, which motion we call Direction. This wee may plainly see in a Marriners compasse, whose Lilly alwayes respects the North point. If a compasse wanting, the same may be shewed in a little corken-boate, which being put in the water with a load stone in it, will so turne and convert it selfe, that the Poles of the Load-stone will at length point out the Poles of the Terrestrial Globe. The manner how, shall be disclosed in these Theorems.

I The South part of the Load-stone turnes to the North, and the North part to the South.

To confirme this affertion, some have produced this experiment. Let there bee cut out of a rock of Load flone, a Magnet of reasonable quantity. Let the two Poles both North and South be marked out in the Load-stone, the manner of which, we shall perhaps teach hereaster: then let it be put in a corken litle boat on the water, so that it may freely float hither & thicker: It will be euident that that part which in the rock or Mine pointed Northward, will respect the South, and contrary wise the South part will respect the North; as we may see in this similar to the south and south a south south.

gure: Let the Magnet as it is continuated with the Mine or A Globe of the Earth be AB, so that A shall be in the North

B



pole, B the South Pole. Let this Load-stone be cut out of this rocke or Mine. and placed on the water in a litle timber boat, which shall be CD: we shall find that this litle dish or boar will turne it felfe fo long, untill the Northpart A,be turned to the Southpart B: and on the other part, the Southpart B, be converted to the Northpart A: and this conformity would the whole rock of Load-stone claime, if it were duided and separated from the

Globe of the Earth. The reason why the magnet in the boat on the water, turneth, windeth, and seateth it selfe to a contrary motion to that it primarily received, whiles it was loyned to the bowels of the Earth, and vnited to the body of the great Magner, is; because every part of a Load-stone being separated from the whole, whereof it is a part, becomes of it selfe a perfect, compleat, magneticall body, (as we may fay) a litle Earth, having all the properties of the great Globe, as Poles, Meridians, Equators, &c. And therefore according to the nature of magneticall vnion, spoken of in our next Theoreme, will in no wile endure to settle it selfe as it did before ; but deemes it a. thing more naturall, and of more perfection, to turne his afpect a contrary way, to that which he injoyed at his first constitution. Here may we note a great errour of Gemma Frisin, who in his corollary vpon the 15 Chap. of his Comographical Comment on P. Appian, affirmes: that the Needle magnetically affected, would on this fide the Aguator, respect the Northpole; but being past the Line, would straightway turne about, and point to the Southpols: An errour (as M. Hues faith) vinworthy fo great a Mathematician. But Gemma Frisim infome fort, may be excused; for a smuch as the grounds of magneticall Philosophy, were in his time either not discouered, or most vaporteelly knowne, and the vacertaine relations of Navigators were reputed the best Arguments: and how easie a matter it is for a Trauailer in this sort to deceive a Scholler, who out of his reading and experience can show nothing to the contrary, let every man judge.

2 This contrary motion here spoken of, is the iust confluxe and conformity of such bodies to magnetical amion.

This is demonstrated by Gilbert in this manner. Let the whole magneticall body be C D, then C will turne to the North of the Earth B, and D ynto the South part A. Let this

magnet be cut in twaine by the midle line or \mathcal{L} quator, and the point E will tend to A, and the part B F D C F, will direct it

felse to B: for as in the whole, so in the parts divided, nature desires the vnion of these bodies. The end E willingly accords with F; but E will not willingly ioyne it selse with D, nor F with C, for then it would have C, against its nature, to move toward A the South, or D in B, which is the South. Separate the stone in the place of division, and turne C to D, and they will conveniently agree and accord; for D will turne it selse to the South as before, and C to the North; and E and F ioynt parts in the minerall or rock, will now be most sundred. For these magneticall parts concurre and meet together not by any affinity of matter, but receive all their motion and inclination from the forme; so that the limits, whether joynt or divided, are directed magnetically to the Poles of the Earth, in the same manner, as in the divided body.

ELA

If any part Southward of the magneticall body be torne away or diminished, so much shall bee also diminished of the North part; & contrariwise if any part be taken away in the Northpart, so much shall the vertue of the Southpart be diminished.

The reason is, because the Magnet having eminently in it the circles which are in the Earth, is separated or divided by a middle line or Equator, from which middle space the vertues are conveyed toward either Pole, as we have before she wed. Now any part being taken away from the North or South part, this Equator or middle line is removed from his former place into the midst of the portion which is lest, and so consequently both parts are lessethen before: For although these two ends seeme opposite, yet is one comforted and increased by the other.

of the motions of Coition and Direction we have handled. It follows that we speak of the motions of the second order, to wit,

Variation, and Declination.

of the directory Magnetical needle from the true point of North, or the true Meridian towards East or West.

In the discourse immediatly going before, having treated of the magnetical body, we have imagined it to be true, and pointing out the true North and South points of the Terrestriall Globe; which certainely would be so, if the substance of the Earthly Globe were in all parts and places alske; equally partaking the Magneticall vertue, as some round Loadstone; neither should we find any variation or deviation at all from the arue Meridian of the Earth; But because the Terrestriall Globe

15

is found by Navigatours to bee vnequally mixed with many materialls, which differ from the magneticall substance, as furnished with rockie hills, or large valleyes, continents, & Hands, tome places adorned with flore of iron Mines, rockes of Loadflone, some altogether naked & destitute of these implements; it must needes fall out, that the magneticall needle & comnasse directed & conformed by the Magnericall nature of the Earth, cannot alwayes fet themselves vp nthe true Meridian; that paffeth right along to the Poles of the Terrestriall Globe; but is forced and diverced toward some eminent and vigorous magneticall part; whereby the Meridian pointed out by the magner, must needes varie and decline from the true Meridian of the Earth, certaine parts or degrees in the Horizontall circle; which diversion we call the Variation of the compasse: so that Variation, to far as it is observed by the compasse, is defined to be an Arch of the Horizon, intercepted betwixt the common intersection with the true Meridian, and his deviation. This effect proceeding from the Inaquality of magneticall vertue scattered in the Earth, some have ascribed to certaine Rockes or mountaines of Loadstone, distant some degrees from the true Pole of the World; which rockes they have termed the Pole of the Loadstone, as that whereunto the magnet should dispose and conforme it selfe: which conceite long agoe invented, was afterward inlarged and trimmed outr by Fracastorine. But this opinion is a meere coniecture, without ground: for what Navigatours could be euer produce that were eye-witneffes of this mysterie? or how can he induce any judicious man to beleene that, which himselfe, nor any to his knowledge ever faw? The relation that the Frier of Norvegia makes of the Frier of Oxfords discouery, recorded by James Choien in the booke of his Trauels, where he speakes of these matters, is comonly rejected as fabulous and ridiculous; for had there beene any fuch matter, it is likely he would have left fome monumets of it in the records of his owne Vniuerfity, rather then to have communicated it to a friend as farre off as Norvegia. Moreover the disproportion in the degrees of variation in places of equal distance, will easily correct this errour, as we shall shew in due placea

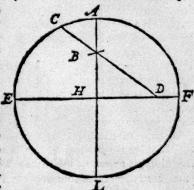
place. More vaine and friuolous are all the opinions of others concerning this magneticall variation: as that of Cortefine, of a certaine motive vertue or power without the Heaven; that of Marsilius Ficinus of a starge in the Beare; that of letrus Peregrinus, of the Pole of the world; that of Cardin, of the riling of a starre in the taile of the Beare; that of Bestardus Gallus, ct the Pole of the Zediacke; that of Livin Sanntus, of a certaine magneticall Meridian; of Francis Maurolycus, of a magneticall Hand; of Scaliger, of the heaven and mountaines; of Robert N. rman, of a respective point or place: All which Writers feeking the cause of this variation, have found it no further off then their owne fancies. More probable by farre, and confonant to experience, shall we finde their opinion, which would have the cause of this variation be in the Inaquality of the magneticall Emmencies scattered in the Earth. This Inaquality may be perceived to be twofold. I in that some parts of the Earth haue the magneticall minerals more then other parts: foralmuch as the Superficies of some parts is solide Earth, as in great Continents : 2, Because although the whole Globe of the Earth is supposed to be magneticall, especially in the Internall and profound parts: yet the magneticall vertue belonging to those parts, is not alwayes so vigorous and eminent as in some other parts: as we see one Loadstone to be stronger or weaker then another in vertue and power: but of those two, the former is more remarkeable, which may be showed by experience of fuch as have failed along many lea coaftes: for if a fea-iourney be made from the shore of Guinea by Cape Verde by the Canarie Ilands , the bounds of the Kingdome of Morocco, from thence by the confines of Spaine, France, England, Belgia, Germany Denmarke, Norvegis: we shall find toward the East, great and ample Continents; but contrary wife in the West a huge & vast Ocean: which is a reason that the magnetical needle will varie from the true point of the North, and inclines rather to the East; because it is more probable that these Continents and Lands should partake more of this magnetical minerall, then the parts couered with the Sea, in which these magneticall bodies may be scarcer, or at the least deeper buried, and not so forceable.

forceable. On the contrary part, if we faile by the American coafts, we shall rather find the variation to be Westward : as for example, if a voyage be made from the confines of Terra Florida, by Virginia, Norumbega, and so Northward, because the land butteth on the West : but in the middle spaces , neare the Canary Hands, the directory needle respects the truePoles of the Terrestriall Globe, or at least shewes very litle variation. Not for the agreement of the Magnetical Meridian of that place with the true, by reason of the Rock of Loadstone, as fome have imagined: because in the same Meridian passing by Brafile, it fals out farre otherwise: but rather because of the Terrestrials Continents on both sides, which almost divide the Magneticall vigour, fo that the Magnetical needle is not forced one way more then another; the manner whereof we shall finde in D. Gilbert expressed in an apt figure, to whom for further fatiffaction I referre the Reader.

The Magneticall variation hath no certaine Poles in the Terrestriall Globe.

It is but a common received errout (as we have mentioned) that there is a certaine Rock or Pole of Loadstone, some degrees distant from the true Pole of the world, which the Magnetical needle in it's variation should respect. This Pole they have imagined to be in the same Meridian with that which pas-

feth by the Azores, whence they have laboured to shewthe reafon why the Compasse should not vary in that place; which they explaine by this Figure. Let there be a circle describing the Spheare, E AF, the Horizon EF, the Articke Pole A, the Antarticke L. The Pole or Rock of Load-stone.



stone placed out of the Pole of the Earth B. Let there be placed a magneticall directory needle in H; it will (according to their affertion) tend to the point B, by the magnetical Meridian H B; which because it concurres with the true Meridian B A,or H A, there will be no variation at all, but a true direction to the North Pole of the Earth. But let this magneticall needle be placed in the point D, it is certaine, according to this opinion, that it will tend to the Pole of the loadstone B, by the magneticall Meridian D B. Wherfore it will not point out the Pole of the Earth A, but rather the point C; because these two Meridians come not into one and the selfe-same. Hence they have laboured with more hope then successe, to find out the longiende of any part of the Earth, without any observation of the Heavens: which I confesse might easily be effected, if this coniecture might stand with true observation. But how farre this conceit swarues from the experience of Navigatours, one or two instances will serve to demonstrate. For if the variation had any luch certaine poles as they imagine, then would the Arch of variation be increased or diminished proportionally according to the distance of the places. As for example; If in the compasse of an hundred miles, the Compasse were varied one degree, then in the next hundred miles it would vary another degree, which would make two degrees. But this hath often bin proued otherwise by diverse experiments of Navigations, mentioned by Gilbert, and E. Wright. I will onely produce one or two. If a frip faile from the Sorlinges to New-found-land, they have observed, that when they come so farre as to finde the Compasse to point directly North, without any variation at all; then paffing onward, there will be a variation toward the North-East, but obscure & litle: then afterward will the Arch of this variation increase with like space in a greater proportion, vntill they approach neare the Cantinent, where they shall find a very great variation. Yet before they come ashoare, this variation will decrease againe From which one instance, if there were no other, we might conclude; That the Arch of variation is not alwayes proportionable to the distance: which granted. quite ouerthrowes that conceit of the Poles of variation. Befide

fide this, if there were two fuch magnetical! Poles, there can be be but one common Meridian, passing by them and the Poles of the Earthly Globe. But by many observations collected and observed by Ed. Wright and others, there should be many magneticall Meridians passing by the Poles of the world : as in the Meridian about Trinidado, and Barmudus, the Meridian about the Westermost of the Azores: lastly, the Metidian running amongst the East Indian Hands, a little beyond Iava Maior, the magneticall and true Meridian must needs agree in one. Now for a fmuch as all these magnetical Meridians passe by the Poles of the earth, there can no cause be assigned why the magneticall Poles should be said to be in one rather then another; and if in any, then in all. Whence it must needes follow, that as many magneticall Meridians as you have to passe by the true Poles of the world; fo many paire of magneticall Poles must you have, which will be opposite to all reason and experience.

The point of Variation, as of Direction, is onely Respective, not Attractive.

It was supposed by the Ancients, that the Direction and Variation of the Loadstone was caused by an Attractione point, which drew and enforced the lilly of the Compasse that way: which errour tooke place from another common-receiued opinion, that all the other motions of the magnet were reduced to the Attractine operation: but the errour was corrected by one Robert Norman, an Englishman, who found this point to be Respective, and no way Attractive. Whose reason or demonstration is not disapproved by Dr Gilbert, although

in other matters hee sharply taxeth him. His experiment is thus. Let there be a round vessell, as we have described, full of water; in the midle of this water p'ace an iron wier, in a convenient round corke, or boat, that it may swimme vpon the water, even poyzed: let this iron wire be first touched with the loadstone, that it may more strongly shew



the point of variation; let this point of variation be D, let this iron wire rest upon the water in the corke for a certaine time; It is certainly true that this iron wire in the corke, will not moue it selfe to the margent or brinke of the vessell D, which certainly it would doe, if the point D were an attractive point.

3 The variation of enery place is constant and not variable.

This bath bin ratified by the experience of Navigatours, which in the felfe-same Regions have never missed the true variation which they have assigned them before. If any difference be assigned in variation to the same Region, we may impute it to their errour which observed it, arising either from want of skill, or convenient instruments. Neither can this ever be changed, except some great deluge or dissolution happen of a great part of land, as *Plato* records of his *Atlanticke* Hands.

4 The variation is greater in places neere the poles of the Earth.

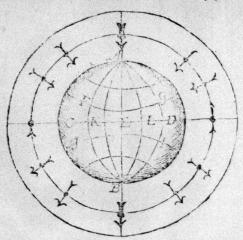
This proportion is not to be taken uninerfally, but commonly for the most part; yet would it have truth in all places, if all other things were correspondent. It is observed that the variation is greater on the coasts of Normay, and the Low-countries, then at Morecco, or Guinea. For at Guinea the magnetical needle inclines to the East, a third part of one Rumbe of the Compasse: In the Ilands of Cape Verde, halfe; in the coasts of Morecco, two third parts: In England at the mouth of Thames, according to the observation of D. Gubert, and Ed. Wright, though some deny it, one whole Rumbe; in London the chiefe city of it, eleven degrees and more, which we also find, or thereabout, in Oxford. The reason is, because the magnetical motive vertue is stronger in the greater latitude increasing towards the pole: and the large Regions of land lying toward the Pole, prevaile more then those which are situate farther off.

nation is a magnetical motion, whereby the magneticall needle converts it selfe vnder

the Horizontall plaine, toward the Axis of the Earth.

What we have hitherto spoken of Direction and Variation magneticall, was such as might be expressed and she wed in the plane of the Horizon, by the Directory needle equally povzed, when it is fet in any point of the Horizon. But this Declination whereof we are now to speake, is the motion of an iron wire or needle, first equilibrated, and then stirred up by the loadstone, vpon his owne Axis, from that point of the Horizon, the other end of it tending toward the center of the Earth: where we may, for the better expressing of the motion, note two things: I That the magnetical wier, fer in a convenient instrument, if it be carried from the Equator to the Pole, or from one Pole to another; will by little and little turne it felfe round, and make a circumvolution about his owne Axell. 2 That by this conversion and circumvolution about his axell, it will according to divers places and latitudes, make divers Angles in divers places; both which are included in this motion of Declination, and are warranted both by experience made by an Inclinatory needle applyed to a Terrella, or round Loadstone; as also by the experience of Navigations on the great Spheare of the Earth. To explaine which motion, there are curious instruments formed and invented by D' Gilbert, & Rid-Ley, which the curious in this kinde, to their greater fatisfaction may peruse. In the meane time we will here content our selues with one figure following, borrowed from their more copious invention, wherein we shall finde enough to expresse the manner of this motion. In this Figure let A B C D be the Terrella or round magnet reprefenting the Spheare of the Earth : A the North-pole, B the South, A E B the Axell, CED the Equator: AK B, and AL B the Meridian circles meeting in the Pole. A C, and B D the Meridian or right Horizon, having in it the two Poles: FG and HI two parallels. The Loadstone being thus designed in his outward Poles, as it is according to his naturalleminencie stored inwardly: Let the Needles be placed (being before touched) on the Limbe ouer-against the Poles, AB.

- Chillian



AB, and we Thal observe them to respect them dirittly.concurring one ftraight line with the Axell of the Earth: Then fet the same Needles in the Limbe ouer-against the Equator CD, and they wil difpose & setle

themselves in a parallell fite to the Axell of the Earth, and incline neither to one Pole or other: Hence may be collected by plaine consequence, that there is a semi-circle betwixt each of these foure needles. Now to finde the quadrants of these, apply Needles in the Limbe at 33 degrees diffant from the A quator on each fide of him, and they will make right angles with the axell of the same, where these eight needles have 8 quadrants betweene them, that is, foure femi-circles which will make two whole circles, one on each fide of the £quator. But if you place the needles in the midft betweene the Equator and the Poles, they will respect the exell but obliquely as in all other parts, except in the eight places before-mentioned. From hence may we learne what we proposed: first that the Declination is a converfion of the magnetical wire or needle vpon its owne axe 1: fecondly, that this wire by this motion so excited, if it be moved on any Meridian North or South, will apply and conforme it felfe according to certaine angles, to the Axell of the Earth. Thirdly, there will arise this corollary, that the magnetical needle about the round Magnet, maketh two circles. Concerning

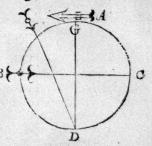
this

this declination we will infert two especiall Theoremes.

The Declination is an spereable to the latitude not in Aqualitic of degrees, but in proportion.

It is manifest out of that which we have spoken, that this motion of Declination supposets two motions; The one of Conversion, whereby the needle is turned round on his owne Axis: The other a Progressive motion, whereby the center it selfe of the Inclinatory Needle is carried forward upon a Meridian from North to South, or contrary wise. These two motions supposed to proceed and begin together, cannot possibly meet in such Equality, as that the degrees of Declination directly answere in Equality to the degrees of latitude, which

is demonstrated by this Figure heere inserted. Let the magneticall body be A, this body while it shall be moved about the Earth fro GD the Equinostiall toward the Pole B, 33 will be turned upon his owne Center, and in the middle of the progresse of the center from the Equator to the Pole B, it will be directed to the Equator D in



the middle betweene the two Poles. Therefore the middle must needes turne faster on his owne center, then the center it selfe turned for ward; that by this conversion it should directly respect the point D: wherfore this motion will be swifter in the first degrees, to wit, from A to L, but in the latter it will be slower from L to B, in respect of the Equator from D to C. Now if the Declination were equall to the latitude, then the magneticall wier should observe and sollow the facultie and peculiar vertue of the center of an operative & attractive point. But reason & experience teacheth, that it observes the whole body and masse, with all the external limits of the Earth and Loadstone; the whole vertues and forces of both concurring.

as well of the convertible wier, as of the whole Earth: Neuerthelesse from this experiment the skilfull in Magneticall Philosophie, have found out a proportion whereby the latitude of places may instrumentally be sound out by the degrees of Declination.

2 The Magneticall Declination is caused not of the Attractive, but of the Disponent & Conversive vertue of the Earth.

There is nothing more admirable in Nature, then the order and fituation of all bodies in their places, most convenient for each ones conservation. For the obtaining of which harmony, (as we have taught in our fecond Chapter) it is endowed with a proper motion convenient, to place and feat it felfe, both for the preservation of it selfe, and the whole Vniuerse. This naturall Inclination is no-where more eminent and confp cuous. then in the harmony of magneticall bodies, which are (as it were) the finewes of the Tarestrial Globe. These motions fome have imputed to the Attractive force, but very erroneoufly, as wee have proved already of Direction and Variation, and shall here demonstrate concerning the Magnetical Declination: for first, if it were caused by any Attractive force approching; it would follow of necessity, that a Terrella or round Spheare; made of a folide or perfect loadstone, would more turne and wreft the magneticall needle, then if it were made of a weaker and more imperfect substance: also that a needle touched with a stronger stone, should shew a greater Declination then that touched with a weaker. But experience hath found the contrary, because the Declination will be all one, be the stone stronger or weaker. Moreover a Loadstone armed with an Iron Note (as they tearme it) put vpon the Meridian in any latitude, will not lift ypa piece of iron more perpendicularly, then if it were naked and vncouered, although it will lift vp much greater and heatier waights; which experiments are fufficient to confirme our affertion, that this Declination is caufed only by the disponent and conversiue vertue of this Terrestriall Globe,

3 The

3 The magneticall Declination hath a varia-

That in the magneticall Direction there is found an Irregularitie or variation, hath bin sufficiently warranted by Artificers Instruments. The like Irregularity is in the motion of Declination, which makes magneticall Instruments and experiments more subject to errour and imperfection. The variation of Declination is defined to be an Arch of the magneticall meridian betwixt the true and apparent Declination. The cause hereof is onely to be fought in the vnequall temper of magneticall parts in the Earth. For as in the Direction, magneticall bodies are drawne and wrested from the true meridian, by the eminent and more vigorous force of the Earth, one fide ouerruling the other: fo the magneticall needle (the conversion fomewhat increased) declines sometimes beyond his naturall fite and conformity. This may cause an errour, but not of any great moment: fometimes when there is no variation of Direction at all in the Horizon, there may be a Variation or Declination; to wit, either when the more eminent and stronger parts of the Earth are placed iuft under the Meridian; or when these parts are more impotent then the generall nature requireth; or els when the Magneticall vigour is too much increafed on one fide, and diminished on the other, as we may behold in the vall Ocean.

CHAP. 1111.

Of the Totall motions Magneticall.

Hauing passed the Partiall motions magneticall, we are next to speake of the Totall motions, which more nearely agree to the whole Earth, such as are the

Verticitie and Revolution.

2 The Verticity is that whereby the Poles of the earthly Spheare, conforme and settle themselves vnto the Poles of the Heaven.

The Spheare of the Earth by her Magnetical vigour, is most sirmely seated on her Axell; whose Ends or Poles respect alwayes the same points in the Heavens, without Alteration.

That which in a litle Magnet or Loadstone is called Dire-Rion, in the vast Globe of the Earth is called Verticitie. To ynderstand which, we must conceite, that the Earth hath natural. ly two Poles, vnto which the meridionall parts doe direct not onely magneticall bodies neare the Earth, but her owne maffie fituation and firmenesse; and settles her selse so strongly by her magneticall vertue passing through the Meridionall parts to the Poles, as if the were tied by many firong cables to two Herenlean pillars, not subject to alteration : And if it should happen by any supernaturall power, that the situation could be changed: The would (no doubt) by her magneticall vigour and verticitie, returne and reftore her feife to her former position, as all magnetical needles will doe to their proper site and conformitie. Of this Verticitie needes no more to be spoken, then hath bin already faid in the point of Direction; because the former is a representation of the latter, and depends on the same demonstration. Out of which ground we may cuidently conclude, that the Axell of the Terrefficiall Globeremaines alwayes invariable: By which we may refute the opinion of Dominicus Maria, who was Master to Copernicus; who out of certaine unperfect observations, was induced to beleene that the Poles of the World were changed from their true and natural fituation: I have observed (faith he) looking on Ptolomies Geographie, that the elevation of the Pole Artickealmost in all Regions, as it is put downe in Ptolomie, differs and failes in one degree and ten minutes from that which we finde

in our time: which cannot be ascribed to the errour of the table, because it is not probable that the whole series should bee depraued according to this equalitie of number. Wherefore it must follow of necessity, that the North pole shou'd bee moved toward the verticall circle: which myffery not knowne of the Ancients for want of former observations, hath shewed it felfe to our times, being inriched not only with their, but our owne experiments. According to this opinion of Dominicus Maria, the North pole should be elevated higher then is was, and the Latitudes of Regions should be greater then they were. But to this opinion we will oppose the opinion of Stathus, which holdeth that the latitudes of Regions have beene decreased and diminished from that they have had intPtolomie, without any fuch regular Increment or Decrement; which hee labours to confirme by many observations: as for example, the latitude of Rome as it is let downe by Prolomy is 41 degrees 3 parts: but by newer observation it is found to bee 41 degrees, sparts: out of which wee may well coniecture, that Prolomies observations were not alwayes exactly true, being for a great part fuch as he had receased from Hipparchus, and not examined himselfe; as may be seene in the latitude of many Citties in Europe, where he missed sometimes 2, sometimes 3 degrees. Wherefore no judicious Geographer would vpon such imperfect observations and vncertaine conjectures bring in a new motion of the earth to ouerthrow that magneticall Harmony and confiftency corroborated with to many and fore demonstrations. This may scrue to answere a certain Tenent of Valquez the lefuit, and some others; who imagine the Center, and by consequence the Pole of the Earth, to be moued vp and down by a certaine motion of Libratio. The argument on which they would ground their affertion, is take from the Center of Gravity, in this manner. The whole maffe of the earth (fay they) is so setled about the Center, that it is equally poized: that is as much as to fay, that the parts are indowed with an equall waight. Now fuch Bodies as are fo equally poized by the addition or diminution of any part on either side, will be straight-way turned from that site which they

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rience of a Ballance, and other fuch mechanicke instruments. Wherefore in the Terrestriall spheare, the Center and Poles should in this wife be changed and altered, and the whole suffer a kinde of starting or Libration. For it is manifest by dayly observation, that some things in the superficies of the earth are fallen off, and carried into another place: as Men, Beafts, and Birds, which moue from one place vnto another. Nothing is here of more moment then the motion of the Sea. by which the parts of the water by continuall ebbing & flowing fuffer fuch a sensible change of Addition and Diminution, that no man can imagine how the parts of the Earth about the Center should alwaies bee equally counterpoized, but the waight on one fide should be predominant vnto the other, and fo drive the Center from his former place. This Argument DeMundi fabr. Blancanus, another late Iefuite, leaues altogether vnanswered; either imagining it too ftrong, or out of a combined faction of their owne fociety, vnwilling to contradict his fellow. And indeed should we consider the spheare of the earth, no otherwise then according to its Elementary constitution; this reason would hardly admit of a folid answere: For how soeuer in the vast frame of the Earth, the addition or subtraction of some parts would make but an infenfible difference: yet can it not be denied, but the least waight what soeuer added or subtracted, would turne it from its . Equall-prize: Nevertheleffe, this I hold too abfurd for a Christian to beleeve, forasmuch as it contradicts the fense of holy Scriptures, which averre the earth to be so setled on her foundation, that shee should not at any time be remoued, or shaken: which motion (as shall bee proved in the second Theoreme) I take to bee understood of such a Trepidation of the Center and the Poles, which by ameraphor are tearmed the foundation of the earth, and not of the

> circular motion, as some have laboured to wrest it. Wherefore nothing is here left vs to fatisfie this doubt: but to have recourse to this magneticall verticity, whereby the poles of the Earthendowed with a magneticall vigor, & ouerswaying the elementary ponderosity of the earthly parts, are (as it were)

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part.3.6.2 .

contracted

so fast bound to respect the same points or poles in the Heauens, that the Center can no waies be shaken, or moued out of his place.

The Magneticall Revolution is a motion by which the whole globe of the Earth is moved round.

Aristotle in his I booke decalo makes 3 kindes of simple motions, out of which hee labours to deduce the number of fimple bodies. The first is the motion from the center, such as is of Fire and Ayre, and all light bodies: the second to the center, such as is of Earth and Water; the third is round about the center or middle, which he ascribes to the Heavens: so that if this ground were true, the Earth could challenge to it selfe no other then the right motion; whereby the parts of it being feparated from the whole, returne to it againe. But this opinion although popular and plausible, hath beene contradicted, as well by ancient Philosophers as moderne : for by long experience and diligent observation, they have found the earth to be endowed with a star-like vigour, whereby the may, having al her parts vnited together by reason of her grauity vnto the Center, and her placemade fure by her magnetical poles, moue naturally upon her owne poles, at least if to be shee claime no other motion. This opinion first blosomed (as farre as I can gather)in the Schoole of Pythagoras, was cherished by Heraclides Ponticus, and Ecphantus, two famous Pythagoreans: to which afterward iowned themselves Nicetus Syracusanus, and Arikarchus Samius; all which have undertaken to defend that the Earth moues circularly, and that this circumgyration of the Earth causeth the rifing and setting of the Sunne, as well as of other flarres, although in the manner they have not expresfed themselves alike, having injoyed as yet scarce the first dawn of knowledge. But all this while Philosophie contented hir felfe with the acquaintance of a few choice friends, not daring to proflitute her treasures to popularity. But when it hapned in after times that the was taught the language of the vulgar, and spake to the vnderstanding of each mechanicke, she soone

contracted some staines, and squared her selfe rather to please the most then the best. Thus the multitude as a vast torrent prevailed against the learned, and cast into exile the inventions of the Ancients which their ignorance was readier to centure then understand. Yet were not the feeds of this Philosophy quite extinct, but as forgotten for a time; vntill there arose Coperniens, a man of incomparable wit, who quickned and reuived it, to his euerlasting praise & our profit: I would not here be mistaken, as though I strongly apprehend these grounds, & reicet all the principles of our Peripateticke Philosophic: I only inueigh against their prejudicate ignorance, which ready to licke vp the dust under Aristotles feet, with a supercilious look contemne all other learning, as though no flowers of science could growe in another garden. I confesse this opinion of the Earths circular motion to be subject to many & great exceptions, and opposed by strong and waighty arguments drawne probably from the booke of God, the touchstone of fincere verity, yet I hold it too strongly fortified to be inuaded by popular arguments drawne from feeming fenfe, and bolffered vp with names and authorities. For mine owne part, I confesse not absolute subscription to this opinion; yet could I not conveniently leave it out, because having undertaken to insert this Magneticall Tract; I would not willingly mangle it in any part, but shew it whole and intire to the view of the judicious; who herein may vie their Philosophicall liberty, to imbrace or reiect what they please. If these grounds seeme true, they will finde acceptance, if otherwise, it cannot indamage Truth to knowe her aduersary. Wherefore I thinke no man will take it amisse that I insert this following Theoreme.

It is probable that the terrestriall Globe hath

Copernicus ascribes three motions to the spheare of the Earth, whereof the first is in the space of 24 hours about her owne axell; making the day and night, and is therefore called the Diurnall: The second is yearely, wherein the Center it selfe of the Earth is moved from West to East, describing the circle

of the Signes. The third is a motion of Declination performed in an annual revolution; reflecting against the motion of the Center; for the Axis of the Earth is supposed to have a convertible nature, whereas if it shou'd remaine fixt, there would appeare no inequality of day and night, Spring, Autumne, Summer, or Winter: I will nothere curiously diftinguish the differences, limits, and periods of these three motions, but leave it to the skilfull Astronomer, to whom properly it appertaines: it is enough for me to shew it probable that the Earth should challenge to it lefe a circular motion, in profecution of which I shall labour chiefly toestable that first motion which is of Terrestriall globe about her owne axis, which is the easiest both to beleeue & vnderstand. That I may the better ex presse the grounds of this opinion, I will labour to proue these two points. I That this opinion is consonant to reason. 2 That it no way contradicts the sense of the Holy Scripture. The former affertion we will againe divide into a articles. I That the motion which we feeke to establish in the Earth cannot without much absurdity be granted to the heavens. Secondly that it no way contradicts the nature of the Earth it selfe. Thirdly, that the arguments produced against this opinion, are not so Arong, but may be answered with probability. First therefore finding the dayly tifing and ferting of the Sunne, Moone, and other Starres to arise from some motion, wee are to seeke out the true subject of this motion. It is agreed upon by all that is subject must be the Heavens, which are carried in 24 houres from East to West, or the Earth which must moue in the same time from West to East. For the first we must take as granted of those which defend the opposite opinion these two grounds That the subject of this motion (if it be a heavenly body) is the first moueable and supreame spheare of all the celestiall machine; because all the rest have affigned them their severall motions. 2 That of two bodies circularly mouing voontle same Center, in the same space of time, that which is greater in quantity must need haue the swifter motion; as wee see the spokes of a wheele to moue faster neere the circumference, but flower in those parts which are joyned to the Center. This granted

granted, we shall find the greatest of the first and supreamest orbs to be so incomparably vast in proportion to the Earth, and the motion of it according to this magnitude to be increafed to fuch a swiftnesse, as must needes transcend all fiction & imagination. For befides the two Elements placed by the Peripaterioles betwixt the Earth and the Celestiall bodies, to wit; Aire and Fire, which challenge no meane distance betwixt their concaue and convexe (sperficies: who knowes not how many diffinct and strange concamerations of Orbes & circles are placed and figned out betwixt the Moon and the first Moucable? Aristotle hath reduced all the Orbes to eight. whereof feuen were allowed to the feuen Planets, but the eight to the fixt Starres, which he supposed to be fastned as so many nailes in the same wheele. But 'Prolomie perceiving this number to be insufficient to satisfie his observations, was inforced to adde a ninch to encrease the number. Yet this contented not Alphonfu, but he must make up tenne. And although this opinion preuailed a long time in the Schooles of Philosophers, ias mott exact and absolute; yet came it farre short to satisfie the fearch of two latter Astronomers, Chevins, and Maginus; who to adde something to Antiquity, have found out another orbe, and so the whole tale is become eleven; and much it is to bee feared that the high-swolne belly of this learned Ignorance, wil beget more children to help the Mother, because all the former haue proued lame and impotent, God send her a safe delivery. To returne to my purpofe; all these orbs thus ranged & concamerated in order cannot but have each of them a great and extraordinary thicknesse and profundity: being to carry in them fuch huge and vast bodies, as the Summe and Starres, which are of themselves mighty Globes, for the most part greater then the Earth, as Philosophers have found out by divers Mathematicall Infruments, and expressed in Tables. Also because amongst the Planetary Orbes wee shall finde them clouen into many partiall and leffer Ortes, as Epicycles and Excentrickes, the first of which must in reason surpasse the thicknesse of the Diameter of the Planet. The profundity of all these Crbes is measured by their Diameters, which we shall find to surmount cach

each other in extraordinary proportion. For the Diameter of the Earth is 1718 German miles. The greatest distance or elongation of the Moone being new, 65 femi-diameters of the Earth; the least is 55 femi-diameters. The greatest elongation of the Moone in the middle space is 68; the least 52 semi-diameters of the Earth. Notwithstanding it is very probable, that the Orbe of the Moone is yet of more thicknesse & profundity. To passe ouer Venus and Mercurie, and come to the Sunne, we shall find his distances from the Earth in his greatest Excentricitie to be 1142 femi-diameters of the Earth. Mars, Iupiter, and Saturne, are yet farther off from the Earth, & their Orbes endowed with greater measure of thicknesse. The distance of the Firmament wherein are placed the fixt Starres, is by the best Mathematicians thought incomprehensible, & not measurable by mans industrie: insomuch that Aristotle holds the Earth no other then as a point, if it be compared with the eight Spheare, which he supposed to bee the highest and first Moueable. To let passe the ninth Spheare; the tenth, which was vulgarly thought the first Moueable, if it be valued according to the proportion of the reft, would have his convexe superficies moved fo fast in one houre, that it would overcome fo much space as 3000 greater circles of the Terrestriall Globe: foralmuch as in the convexe superficies of the starry Firmsment, it would contain more then 1800. And who can be fo sharpe fighted to see the profundity and thicknes of this orbe, containing in it starres innumerable; whereof some are apparent to each mans eyes, others lying hid by reason of the distance, whereof many haue lately bin discovered, by reason of the Trunk-spectacle lately found out: so that it may be a probable coniecture, that all these statres are not placed in the fame Orbe, or at least that this Orbe is farre greater and deeper then the ordinary current of Astronomers have imagined it to be. To these eight Orbes here deciphered, should we adde the Calum chrystallmum, the Primum Mobile, the Idol of our common Astrologers; and another which Clavius and Maginus have loyned; what bound should we fet to the greatnes of the Heauens, or the swiftnesse of their motions? how farre beyond KA

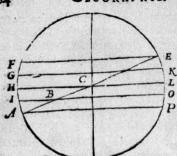
beyond all rouing imagination or Poericall fictions should it transcend, as the which neither Nature could euer suffer, or the wir of man understand? a motion a thousand fold swifter then the flight of a bullet from a peece of ordinance, I hada Imost said, then thought it selfe: For if a man cast his imagination on some marke or degree in the Sunnes parallell on the Terrefficial Globe, and somfantly transferre it to another, & fo to a third, paffing ouer at each time the distance of 100 miles; he would find the Sunne to bee farre swifter in his motion, and to have over-passed him incomparably in his course: were the Sunne placed in the superficies of the Earth, and his course no greater then one of the greater circles of the Terrene Globe, he should by their owne computation, finish his course in 24 houres; and fo runne 21000 miles in that time, which maketh 900 miles in one houre. And if this motion feeme fo fwift, that it could hardly have credit among ordinary capacities; what should we think of this motion, which is imagined infirity ly lwifeer? If Prolomie feared left the Globe of the Earth should be diffolued and shattered in pieces by a far slower motio; of what should we imagine the heavens to be made, which can fuffer so portentous and incogitable a whirling? Here the common Philosopher stands astonished, and rather then he will Be thought to know nothing he will fay any thing why (faith he) should we not bel eue it? fith the Heauens in their motion find no Relistance, whereas all other bodies are flacked by the mediam or Aire by which they are to moue. If in the Heauens were any fuch les or hinderance, it would be either in the Agent or Mouer; or in the Patient or body moued : Not in the mouer, because (as Ariffette hath taught) the Heavens are moned or turned round by an Angell, or Intelligence, fixed to his Orbe, of a Spritual and immateriall Substance, which in a body meetes no opposition. Not in the body moued: because of it's owne Nature it is prone and inclinable to this motion. But this reason is like a reed that hurts his hand that leanes on it: for first, what indigence or necessity in Nature is observed so great, to be the father of fuch Intelligences? What serious judgment can euer imagine the Angels to be like gally-flaues chained faft

to their gallies, or turne-fpit dogs labouring in their wheeles? To what vie shall they serue? not to stirre vp and beginne the motion; for why should we debarre the Heauens from the priuiledge of all other Bodies faire leffe excellent, whose motions challenge no other cause or beginning then their owne forme and nature: Not to Regulate and confine this motion; for Nature which beginnes any action or motion, is able of her felfe to fet limits and bounds vnto it, without the helpe of any externall agent. Finally not to continue this motion; for as we are taught in our Philosophie, Euery Natnoall Agent, if it be not hindered, still acts to the vttermost of his power, and therefore needes no externall coadiutor to continue his action: for otherwife we might suppose the Heauens to grow weary and faint in their intended course. Secondly, whereas they say there can be no Refistence in the body moued, they contradict their own grounds: for it is agreed by all, that the higher Orbs doe turne and wrest about the lower: I would willingly aske, by what kinde of action, either by a vertuall influence or emanation, orels by a corporall couch and application: The former is improbable, and (as farre as I can gather) not auouched by any; and were it so, it would feeme ridiculous; for why should wee rather ascribe this effect to an voknowne influence of an externall body, then to the vigour of his owne forme and nature. For if one orbe in this fort can moue another, why could it not moue it telfe, being more present to it selfe then any other? If they fay by a corporall application of bodies and their parts, I fee not how they can avoide this Renitencie and reaction, which alwayes doth suppose some resistence: for. how can one folide and hard body bee imagined to heave and push another forward without some reluctancie in the patient? because the inferiour Orbe having of selse a proper motion, this must needes be violent, as supposing a forcing & wresting of Nature from her proper course, whereof it is not hard to shew a sensible demonstration; because the Orbe naturally directed one way, is turned and directed another way at the fame time: which both motions concurring in the fame body, must needes offer violence one to the other. Moreouer the inimunuy

munity from corruptible qualities granted to the Heavens, which is the ground of this opinion; hath bin much talked of amongst the Arsstoteleans, but never warranted by any certain demonstration: wee see (say these Philosophers) the Heavens to have remained fince the beginning of the World, without any sensible alteration and change; and therefore must all the Elementarie and corruptible qualities be excluded. To disproue this, I need goe no farther then the last Comet, which Mathematicians by the parallaxe found to be in the heavens. And whereas otherwise they seeke a sensible alteration in other parts, they deceiue theselues: for as in the earth whereo we dwel, however the parts interchangeably corrupt and ingender daylie, yet the whole Globe will apparantly remaine the fame, keeping it's integrity: so may it happen to many of the superiour Globes, whose parts daylie corrupted and renewed againe (although, for the great distance, to vs insensible) the whole Globe remaineth still perfect in his perfect spharicitie. I cease any further to invade anothers Prouince, and therefore descend to a second argument, to proue this extraordinary, violent, and fwift motion in the heavens to be improbable. It is ordinarily observed in other Orbes of the heavens, that the higher the Orbe is placed, the motion is flower; as for example, the Spheare of the Moone, which is next the Earth, is carried about in 27 dayes. Mercury and Venus are flow enough in their course, as the former in 80 dayes, the latter in 9 moneths: the Sun in a yeare; Mars in 2 yeares; Iupiter in 12; Saturne in 30. Alfo those Aftrenomers which give the fixt starres a motion, would have them to finish their course, according to Ptolomie, in 36000: but if we will beleeve Copernicus, in 2,816 yeares: fo that the higher and greater the circles be, fo much flower will be the motion: what injurie were it then to the concord and harmony of Nature, to impose vpon the highest Orbe of all, such an vnmeasurable strange motion, which might strike the most Serabicke Angell into admiration? To these may be added other Arguments in Copernies, which albeit they be not demonstratiue, will make the matter more probable. First, that Nature in all things is a compendious and short worker, and vieth not many

many helpes for fuch things as may be performed by fewer: & therefore need we not to vie the helpe of to many Orbes and concamerations to square our observations, which will finde more fleady footing in this one ground once granted, of the Earth's circular motion: Secondly it will feeme more confonant and egreeable to Nature, that the highest and vetermost Spheare of all, which bounds and engirts in all the World befides, should rest quiet and vnmoueable, then to suffer such an intollerable motion, as might endanger the whole Fabricke. Lastly, I may adde this one, that this diurnall motion, granted to the first Moueable, can in my indgement hardly stand with the regularity of heattenly Bodies, if we expresse it no otherwise then the ordinary fort of Astronomers. For a regular motion is defined, that whereby in aquall times abody is moued through aquall places. But this diurnall motion received from the first Moueable, concurring with the Sunnes annual! motion, will exclude this aquality. For first it is granted, that the Sunne in his motion from the Aguator, to the Tropicke, according to fense, runnes every day in a diffinct parallell: for although enery minute ne declines somewhat from the . Equator toward the Tropicte, yet the difference is not sensible: fo that we may well every day affigne a parallell line to the Sun's motion. Secondly, they must grant that these parallells are diminished, and grow lesse and lesse roward the Tropicke, from the Equator. Thirdly, that (as we have fore-shewed) of two bodies mouing in the same time on the same center, that should moue faster, which is greater: so one body mouing in diverse vnaquall circles, in aquall time, it must of necessity follow that it must needes moue faster, in that which is greater : here wee may cooclude, he moues faster in the Aguator, then in the Tropicke, because in the one he is carried in a greater parallell. in the other in a leffe, and yet in the fame period of time, as we may fee in this Figure following. Let the Sunne be in the point of the Eclipticke, A, it is manifest that hee will fensibly moue for that day in the parallell A P. Then let him bee moved by his periodick motion, into the point of the Ecliptick B, it will for that moment move in the parallell IBO. Last of

GEOGRAPHIE. The first Booke.



all, let it be in the point of the Equator C. his parallel will be H C L. It is manifest out of our former grounds, that he will bee moued slowest in A P. Faster in I O. Fastest of all in H C L. Which swiftnesse and slownesse in the Sunnes motion makes it irregular. Some haue thought to salue this by say-

ing that this motion is Regular, because in equall time, the Sun goes proportionall, not aqual spaces, which Aquillonius holds in his Opticks. But this shift is friuolous; because it takes not away the objection, why the Sunne should move faster & flower. For the Heauens being a naturall, not a voluntary agent; and according to these grounds finding no hinderance or impedidiment; must alwayes worke to his vtmost power, and so cannot flacke or increase his action, or motion, that it should move faster or flower. Hitherto have we shewed that this Dinrnall motion cannot without some absurdity be granted to the heauens: in the next place we are to shew, that it no way can crosse the Naturall disposition of the Earth it selfe, which wee shall demonstrate in this manner. If this circular motion should croffe the disposition of the Farthly Globe, it would happen either immediatly in respect of the meere Nature, which the Logicians call à priori; or els in regard of certaine properties, which tollow necessarily the Nature of it, which they terme à posteriori. If they say it happens à priori in regard of the mere Nature, they must necessarily have tecourse to the proprieties & accidents for a demonstration: For the Internal formes of all things being in themselves insensible, cannot be discouered vnto vs but by their externall proprieties. But if probable conie-Aure may here find any place, I fee nor; alon why the earth being found to be of a magneticall temper, should not challenge the

the fame which other magneticall Globes farre greater then the Earth, possesse; to wit, a circular revolution about her own Poles: which Kepler and Galilans have observed as well in the Sunne, as Inpiter: and in like matters to judge alike, feemes more warrantable, then to faigne a disparity, which Nature neuer grounded, or observation found. But this, as a matter of small note, I casily p sie ouer, following the foot-steps of our Adverfaries, which feeke to demonstrate the Earth's stabilitie out of the externall effects and proprieties. If then this 'Revolution contradict any proprietie, it must be of necessity either in regard of the Quantity and Magnitude; or els in respect of the figure and quality, or of some Motion, or of the fite and pofition; for I find no other propriety of any moment which can enter into this confideration: First, that the Quantity can no way thwart this circular Revolution, is manifest, because it would happen either in that it were too Great, or too Little. It cannot be by reafo of the greatnes; because the great globes of the Sun & Impiter, manifold greater then the Globe of the Earth, are by late experiments of the Trunk-spectacle, found to moue about their owne Axel in a finall portion of time; the like have others delivered of the Moone and Venus. It is not then the Maffe or quantity which can hinder it in the Earth; neither on the other fide can it bee the smalnesse: for bodies smaller are found as apt, or rather apter to receive a circular motion, which they will aot deny me; and therefore cannot this be prejudiciall to the motion of the Earth. In the next place the figure of the Earthly Globe cannot hinder this motion, because by all found Philosophers, being acknowledged to be Spharicall, it cannot but be deemed m if apt to receive Revolution; infomuch as found have hence laboured to draw an argument for the Earths circular motion, as deeming this Figure to be given to the Earth for no other end or vie. Thirdly, no Quality in the Earth can refift this circular motion; for this quality (by the confent of all) would be the naturall heavines or waight of the Earth: But this heavines takes not away the natural! Revo-Intion: I Because Gramie or heavinesse is nothing els but the inclination of the parts of the Earth, returning to their naturall

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turall place, having beene sequestred from it : but these parts having once regained their proper places, move no farther, nor are in those places esteemed heavy, or waighty: whence it is commonly faid among ft the Peripatetickes, Nihil gravitat in fue love, nothing is heavy in his owne place, which may eafily be demonstrated out of Statick principles, whereby we finde heauinesse and lightnesse to be given to the bodies according to the medium, and their massinesse and solidity in respect of one to the other. 2 If this heavineffe bee opposed to the circular motion, then either immediatly by it falfe, or fecondarily by fome concomitant accident. It cannot be the first, because gravity is a quality; but motion, an action; which for ought my Philosophy hath taught me, are not opposite: If by reason of some accident; then (no question) because it is contrary to lightnesse or levity, which feemes requifite to fuch a motion: We willing y yeeld this naturall gravity of the parts of the Earth to fland oppolite to the motion of Ascent or mouing vpward from the Center; but neuerthelesse it is not any way contrary to the circular motion: 1 Because contraries are alwayes supposed to be in eodem genere, in the same kind: but the motion of heavy bodies to the Center, and of the Earth about the Center, are not in the same kinde, the one being a right motion, the other encular; neither can the waight of the Terrestriall masse adde or diminish any thing in regard of the circular motion; because a Sphericall and a right motion cannot either directly concurre, or directly oppose one the other. 2 We may vige out of the 4 Chap. of Aristotles 1 booke De Calo, That no circular motion can admit of contrarietie: which he confirmes by a demonstration, which we forbeare here to infert, being loath to roue too farre from our present matter. At length wee will proue that this orbicular motion given vnto the Earth, cannot overthrow or thwart any other motion of the Earth: for if this were fo, it would happen for one of these two respects; Either because the Earth hath fome motion or other contrary to this; or els because divers motions cannot be in the Earth. The first cannot be true, for that we have spoken before; because the right motion they finde in the Earth, cannot be sudged contrary to the Spharicall.

S: herteall; neither can the later be admitted as an undoubted truth: for how focuer Aristotle fers it downe for an Axiome, that one simple body hath but one simple motion, yet being absolutely understood without any limitation, will be found by experience falle: for it is manifest out of the experiment of the new Persticils, that the Bodies of the Sume and Impiter, fimple innature, (if we beleeue Aristoteleans) haue at least a double motion, the one vpon their owne Poles leffe then Diurnall, the other of their Centers, which are moved from the West vnto the Faft, vpon other Poles familiarly knowne vnto Aftronomers. The leripatetickes heere feeke an evalion, by diftinguishing the motions of the Planets into a proper or naturall and Accidentall, or mutuaticious: but this answer comes not home to this present quastion. First, because these two motions of the Sunne and Inpiter will eafily be proued to be natural and without violence, or restraint: Secondly, because in this answer they suppose the Heavens to bee cut and divided into diverse Orbes, Sections, and Concamerations, which later Astronomers voon better experience haue derided, or at least omitted as Hypotheses or suppositions, to settle Imagination, rather then reall, or true grounds. If they would vnderstand this Principle of Ar stotle, to wit; That one simple body should challenge one simple motion: of a motion of the same kinde it might perhaps obtaine some credit. But the right motion of the parts iovning to the whole, and the Circular motion: also the Circular motion of a Planet about his owne Axell, and the Circular motion it selse about the Earth, are found to be in diverse kindes, and therefore no way incompatible in the fame subject. Moreover what infallible argument can perfuade vs, that the Globe of the Earth is a meere simple Body, such as Aristotle describes vnto vs in his Philosophie? Either this imaginarie simplicitie must be sought in the Reall Existence of the Earth, orels in our mentall Abstraction. The former they cannot averre, because not only the Elements themselves by their own confession, are impure and corrupted: But the whole Globe of the Earth seeemes to confist of diverse mixtures, and Heterogeneall bodies, which apparantly exclude fuch fimplicity. If they

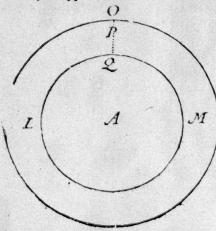
they would have it rather to confit in the Abstraction or separation of the minde, which may divide and diffinguish betweene the true nature of the Earth, and his Accidentall Natures; I shall not contradi I: although it seeme rather grounded on imaginary coniccture, then experience: That the Earth of it selfe distinguished from the waters, should have any such fimple Nature. If we follow reason and experience as our Guides, we shall observe in the Terrestriall Globe a twofold constitution; The one Element rie from the parts whereof it confifts, out of which it cannot challenge any motion, but the right, which is of the parts separated from the whole, agreeing to the Earth, Water, and all other heavy bodies thereof confififting. The other magneticall, wherein all other bodies are vnited in one Magneticall forme of the Earth. In which fort the whole Globe of the Earth may be termed a Homogeneall fubstance: for howfoeuer the matter and the Elements whereof it conlists, seeme Heterogeneall, & diuerse one fro the other; yet fince in this Magneticall Nature, there is a Harmony & Communion, well we may call it a Homogeneity of the Forme and Nature; not of the Matter and Quantity, as common Philosophers commonly vie the word: So that every part or Element whereof this Terrestrial! Spheare is compounded, may claime his owne motion, and properly; yet all conspiring in one vniverfall forme of a Sphæricall Body, may notwithstanding bee turned round with a spharicall motion. In the last place wee are to proue that this Circular motion granted voto the Earth, can no way oppose or indanger the na urall fire or position of the Earth: If the fituation or position were seared to be changed, it must needes happen one of these wayes; either that the Center of the Earth should be moved out of his place: or that the parts should be separated & distracted one from the other: or that the Poles should be changed and allered: The first cannot touch our affertion; because in this place we affirme not, that the center of the Globe is moved out of his place; but that the whole Earth in the same place is turned round upon her owne Center. For the opinion of Copernious, which holdes the Center of the Earth to move round about the earth, we shall

censure in our next Chapter. In the second place, the parts of the Earth by this motion cannot be separated or disunited one from the other: first, because all the parts are vnited to the whole by their naturall grauity; that if by chance they should be separated, they would naturally returne backe vnto their owne place, Secondly, this motion is supposed Naturall & not violen; which in fo great and maffie a Body, can make no fenfible Alteration Lastly, the Poles of the Earth by this meanes. cannot be moucd out of their places; because by a certaine Magneticall verticity (as we have formerly shewed) the same Poles of the Earth alwayes naturally respect the same points of the Heavens, as if they were bound vnto two firme Pillars indisfoluble. Hitherto having proved the Circular motion of the Earth, neither to be given to the Heavens without fome absurdity, and yet no way to contradict or oppose the Nature of the Terrestriall Globe; we are in the third place to examine the reasons vsually vrged against this Assertion. The first reason is drawne from sense. If there were any such Sphericall motion (fay they) how comes it to passe, that it cannot of vs be perceived? an Argument worthy such Philosophers, as measure all rather by seeming sense, then Demonstratine reason; who cannot observe on the sea in a calme, that the ship wherein hee is carried will feeme to rest, or at least to moue flowly, and the clifts and shores to move vnto the opposite part? What then should we thinke of the motion of the whole Terrestriall Globe? which hath lesse cause to be perceiued, then that of a ship? The Bulke of a ship, in respect of the Earth is small and of no quantity; the other being huge and maffie: The motion of the ship meerely violent, inforced by the windes; of the Earth naturall and uniforme, flirred up of his proper and naturall inclination, so that if any such motion be in the Earth, it were impossible to be perceived by sense: Secondly, they vige against vs, that in Homogeneall Bodies, there is the farre motion of the whole, and all the parts: But enery part of the Earth (as experience teacheth) is moved downeward toward the Center, and therefore the whole can have no other motion: To this objection we have partly answered before:

fore: yet to give further fatilfaction, we will adde fomething more: It is one thing to speake of the whole Terrestriall Globe and Spheare; another of the feuerall parts and Elements whereof it consists: If the whole Spheare be understood, we ascribe vnto it no other motion but the circular, which we here labor toeftablish. The parts wherof this Terrestrial Spheare confills. may be confidered two wayes; either as they are united in the whole by a Magneticall forme, or discorned and taken by thefelues: In the former the parts of the Earth are supposed to moue in the fame motion, by which the whole Spheare of the Earth is moved; because the whole and all the parts taken together, are the same, and subject to the same circular revolution. Notwithstanding this, any part seuerall and dissoyned from the whole, hath a right motion downward toward the Center, by which it returnes to its true naturall vnion. This inclination of the part agrees not with the whole Earth, neither vnto any part vnited and conglobated to the whole; but onely to a part separated from his place; so that the whole, may not with standing in his place inioy a circular motion. Now to come more nearely home vnto their Arguments drawne from the Homo. geneity of the Earth, we answere as before, that there is a twofold Homogeneity: The one of the matter and quantity; the other of the Magneticall forme and Nature of the former : wee. may conclude out of the right motion of all the parts, the difpolition of the whole, fo we understand it in a good sense: first that every part is heere to be understood, not in, but out of his proper place; Secondly, that by the whole, wee ought not to understand the whole Globe with all his parts, conformed in one Sphæricall frame; but all the parts indefinitely taken; for if we should understand of the whole Globe, their Argament will in no way hold true: If according to the later, we might well grant them their Conclusion, yet can it not oppugne our Affertion: Because it will follow out of the Naturall inclination of every part, that all the parts feuerally taken, have fuch a disposition of returning to the Earth, being separated therefrom: Yet will not this by any necessary inference be proued to agree to the whole Globe of the Earth; but rather will it follow

follow contrarywife, that the whole Spheare of the Earth is moued circularly, and therefore every part with, and in it, is moued with the whole in the fame motion. A third argument which is thought greater then all the other, is drawne from two experiments: The first is, that a stone or Bullet let fall from a higher place to the ground, will perpendicularly descend to the point of the Earth right vnder: Secondly, that two Bullets imagined to be of equall weight and matter, being difcharged from equall pieces of ordinance, with the like quantity of powder, the one towards the East, the other towards the West, will reach an equall distance in the Earth; both which would feeme impossible if wee grant this supposition of the Earths circular revolution. For in the former case, the Earth fliding away fwiftly during the fall of the stone, would change the point marked out for another. And in the second, for the like cause, the Bullet shot towards the East, being prevented by the swiftnesse of the Earth's motion, carrying along with it the Ordinance out of which it proceeded, should returne backe ouer the shooters head; and contrary wife that Bullet shot towards the West, besides his owne motion, by the motion of the Earth the other way, should be carried so much farther, as the Earth is removed from the place where it was first discharged: Both which experiments sceme to crosse this circumgyration of the Terrestrial! Globe, which our magnetical! Cosmographers labour to confirme: But with them to give an answere to these and the like experiments, we must distinguish the parts of the Earth into three forts; some are hard and solide parts, adioqued to the Globe, as stones, mineralls, & what elfe in the bowels of the Earth is vnited to it, or at least necessiarily adherent to the outward face of it. Some other parts there are of a thinne and fluid substance, as the Aire and other vapours in it, deriued from the Earth; A third fort there are of fuch parts as being in themselves solide, are notwithstanding by some violence separated from the solide globe, as stones cast into the Aire; Arrowes, Bullets, and fuch like, discharged from the hand or Engine: For the two former wee may eafily imagine them carried with the same circular motion, which we af-L 2 figne

figne vnto the whole, being no other then the parts of it depending from the whole masse: For the third fort (whereof confifts the difficultie) we cannot imagine them fo moued round, as if they were wholly separated from the Communion of the Earthly Spheare; for howfoeuer there feemes a feparation according to matter and quantity, yet retaine they the same magneticall inclination to the whole masse, as if they were vnited to it; and therefore such solide parts are moved with the same vniforme and naturall motion wherewith the Earth it selfe is turned; so that in solide bodies so separated from the supersicies of the Earth, as of an Arrow or Bullet shot, we must imagine a twofold motion: The one Naturall & vniforme, wherby they are moued as homogeneall parts according to the revolution of the whole Spheare: The other violent by the force impressed from the Agent : The right motion proceeding from the strength of the shooter, cannot cross: or hinder the Naturall, because the one being right, and the other circular, admit no fuch proportion, as that one should hinder or further the other: Neither can these motions well bee termed contrary or opposite, which are in divers kindes: To explaine



this matter farther, we wil adde this Diagramme; Let the whole Orbe of the earth bee imagined to be L QM; whose center is A, the thicknesse of the aire ascending fró the Earth O Q. Now as the orbe of this fluid fubstance of the Aire ascending formely is moued round with the Globe

Globe of the earth, so must we imagine the part of it marked out by the right line O Q to bee carried round with an vnalterable Revolution. Wherefore if any heavy body should bee placed in the Line O Q; as for example P, it will fall downe toward the center by the shortest way in the same line O Q: which motion downwards towards the center, can neither bee bindered by the circular motion of the Earth, nor yet Mixt or compounded with it: It cannot bee hindred: because (as wee haue shewed) a Right motion and a circular being not in the fame kind, cannot properly be reputed contrary : Neither for the same cause can they bee mixt or compounded: Wherefore this motion will be no other then one simple and Right motion, neuer varying from the Line OQ: which being once vnderstood, it is no hard thing to imagine a Bullet or stone forced by equall strength from Q towardes L, and from Q towards the point M, to obserue alwaies a like distance not withstanding the Earth's circular Revolution. Hauing hitherto shewed this Sphæricall motion of the Earth to be possible, & no way to contradict Nature, we are in the next place to shew it to be no way opposite to the sense of holy Scripture. This opinion of the Earth's circular motion, hath suffered much wrong by a certaine perswasion of some men, that it contradicts the Text of holy Scripture. Some precise men, more ready to vrge, then understand what they alleage, will condemne without examination, and sticke to the plaine letter, notwithflanding all absurdities, denying the conclusion in despight of the premisses. To these have associated themselves another fort, more to be regarded, as more learned; the Critickes (I meane) of our Age, who like Popes or Distatours, have taken vpon the an Vniuerfall authority to cenfure all which they never vnderfood. Had these men contained themselves in their own bouls, they might questionlesse have done good service to the Commonwealth of Learning. But when the feruant prefumes to controlle the Mistriffe, the house seemes much out of order. To sceke for a determination of a Cosmographicall doubt in the Grammaticall resolution of two or three Hebrew wordes. (which some haue gone about) were to neglect the kernell, and make

make a banquet on the shells. But how soeuer, we hope to make it appeare, that the Scripture vnderstood as it ought to bee, is fo farre from faucuring their opinion, that the wordes themselues can hardly admit of such a sense, as they would fasten on them. But ere we descend to the examination of particular places of holy Scriptures alleaged in their behalfe, wee will shew this opinion to be much different from that of Coperniem . as somewhat more moderate, and able to suffer an easier reconcilcment with the holy Text. For the places alleaged of facred Scripture, which feeme to oppose our Affertion, either feeme to proue the eireular motion of the Heauens, or the reft, & stability of the Earth. But this opinion holding a Mediocrity betwixt both, neither takes away the motion from the Heavens, neither oppugnes such a Reft or quietnesse in the Earth, as the Scriptures understand, For first, albeit wee take away from the Heauens the diarnall motion, and give it to the Earth, yet we grant to the heavenly Orbes their feueral motions, allowing no part of it to be absolutely voide of motion. Secondly, we must vnderstand this in a fourefold sense; as oppoled to foure kindes of Motions. First to the progressive Motion of the Center of the Terrestriall globe from place to place, Secondly, to the feparation or diffolution of the parts one from the orher, by which the Globe may loofe his integrity. Thirdly to the Translocation of the Poles, whereby the Poles inclining to one fide or another, may bee imagined to change their pofition. Fourthly, to the Dinrnall Motion. In the first sense we giue a Rest and stability to the Earth, because the Earth, howfocuer moueable, we place in the Center of the world, as wee shall proue in the next Chapter. In the second sense wee also grant it; because all the parts of the Earth being of a heavy nature, fall naturally downwards, and vnite themselves vnto the whole, to decline such a diffolution: In the third acception weelikewise allow such a stability: because the Poles of the Earth (as wee have shewed) by their magneticall inclination, alwayes respect the same points in the heavens, & can from thence by no meanes remooue themselves. Only in the fourth & last fense we exclude a Reft, allowing onely a diurnall Revolution from West to East in twenty source houses. The first

first argument alleaged against vs is taken out of the T Chapter of Ecclefiaftes: Vna generatio (faith Solomon) abit, o altera advenit, quamvis Terra in faculum permaneat. Wherein by the word namy which fo ne interpret (Stat) they would inferre a perpecuall stability of the Earth. A childish confequence, which a grave Divine might well be ashamed to vrge: every man of common vinderstanding may plainely perceive that Solom ns scope in this Chapter was, to shew the vanity & vicertainty of all things vider the Sun: which as a speciall argument among it others he amplifies from the successive mutation and changes of men liuing on the Earth : in that one generation goeth away, and another commeth, but the Earth keeps her integrity, and remaines in the same state. This Constancy then, or remaining of theearth, we can in no wife oppose to any circular motion, but to the changes and vacertainty of men in their generations; in which fense our most learned Linguists understandit. Would not this seeme to any man a ridiculous argumentation, if any man should thus dispute : One Miller comes, and another goes, but the Mill remaines still: Ergo the Mill hath in it no motion ? Or in a River, one generation of Fishes is produced, and another is decayed, but the Riverremaines the same, Ergo the River remaines still vnmoued? Let any man goe no farther then the plaine wordes whereon these Grammarians stand, he will easily find out another in: erpretation. For the word עמרה derived from למדר fignifies as much as to perfift, subfift, or to endure, being opposit to 772 which signifies as much as to stagger or start aside from his place, or position: so that nothing from hence can be inferred to contradict the Sphæricall Revolution of the Earth in her proper place, vpon her own Poles, which we only maintaine. A second reason they draw from the Psalme 10 , out of these words, יסד-ארץ על מכוניה בל-תמוט עולם וער Fundavit Tawherein (as one would perswade) no lesse then three argu- 1am super baments are couched in three bare termes: But these arguments les sus, ne diwill (I fear) proue as litic as the former. For first the word move atar in le. fignifying as much naturally as to found or feat in a place "" mueil. 5. or frame, is not altogether, without a Metapher given to the

Earth, because Almighty God hath so placed it vpon her own center Poles & Axell that the cannot be moved out of it: Likewife אינורה implyes no other then a feat or place, being derived from the word 772 which fignifies no more then to perfeet eftablish or make ready: The third is worn from the word which can fignifie no other then to incline, to rod, flide, fall, or turne afide out of his place: All which can suffer no other paraphrase or Interpretation then this: That Almighty God hath fet the Globe of the Earth fo ftrongly fixed in her proper frame, that no power can be fo firong to diffolue this Fabricke, or turne her out of her appointed place: which expofition of this place of Scripture, Coperniem himselfe would eafily grant, as no way opposite to the triple motion hee labours to establish. Here are these three arguments drawn from three words, fuddenly shrunke into nothing. Another reason which I take to be stronger then the former, some have taken out of the 19 Pfalme; where speaking of the Sunne, he vies these words. In them bath he set a Tabernacle for the Sunne. t Which is as a bridegrome comming out of his chamber, and retoyceth as a grant to runne his courfe: 6 His going forth is from the end of the Heavens, and his circuite unto the ends of it: and there is nothing hid from the heat thereof. Out of which words the Heavens should seeme to challenge the motion, which wee haue given vato the Earth. To this we answer two waves: First, that although this may oppugne Copernicus his opinion. that the Sunne standerh still in the middest as the center of the World; yet may it well fland with our Affertion, who allow the Sunne his feuerall motion in the Ecliptick: whether those words of the Pfalme be to be understood of the Sunnes Dingnall or Periodicke Motion is not fo foon decided: the Scripture not specifying expressely either. 2 we may answer with the Copernicans; That the Holy Ghost in these or the like places speakes A', Spons na Sas: being willing to descend to the weakelt of mens capacity, and not to trouble mens conceits with fuch matters as to vulgar judgments might feeme vnlikely or improbable. The like Analogic of speech may we finde in the first of Genesis, where the Moine is called one of the greater lights

lights in regard of her appearance, being notwithstanding one of the leaft. These may suffice to shew the opinion of the earths circular motion to be probable: I promifen no more, & Ihope I have performed no leffe. I neuer held it an article of my faith. to defend the one or oppugne the other; and therefore leaue every man to his owne free judgement, to embrace or reies what he pleafe.

CHAP. V.

Of the Site, Stability, and Proportion of the Earth.

F Terrestrial affections which agree in respect of the Earth it selfe, wee haue hitherto spoken: We are now to treate of such as agree to it in respect of the Heauens. These are chiefly three; 1. The Site, 2 The Stability. 3 The Proportion.

2 The Site is the locall position of the Earth

in respect of the Calestiall Bodies.

It might feeme a hard and almost impossible taske for any man to reconcile that which hath beene spoken in the former Chapter concerning the Earths circular Revolution, with the grounds of common Geographers, which hold the Terreffriall Glabe to be lette I and fixed in the Center of the world. The reason is; because such as hold the circular motion of the Earth. (whereof the chiefe is Covernicus) would have the Surio fland Hill, as the fixt Center of the Universe, and the Earth to move round about him betwixt Mirs & Venus, which feemes cleane opposite to the former opinion. I must confess that Coperais a his opinion encirely taken and understood, standeth altogether oppolice

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opposite to these our grounds: yet may that motio of the Earth which we have established in the former Chapter (for ought I vet knowe) be well reconciled with their opinion, which hold the Earth to be the Center of the world. For the circular Revolution we gaue to the Terrestriali Globe, was not a motion of the Center of it, from one place to another, as that of the Starres which moue round about the Earth; but rather a turning of it felfe in its owne place, vpon her owne Poles and Axell-tree, in such fort as the wheele of a mill, or such a like engin fixt in one place is turned upon his owne Axell: So that the motion we there understood was only the Dinrnall motion of 24 houres, making the Day and Night. The other two motions mentioned by Copernicus, may be found out in the Heavens, & left to Astronomers. The reasons why I entirely embrace not Coperniens his opinion, are chiefely two. First, because it feems too harsh and dissonant in nature, to make one and the selfesame body subject to so many motions, especially such as by common Philosophers is denied all motion. Secondly, because the other motions granted to the Earth must needs suppose it to be placed out of the Center of the world; the contrary of which we shall in this Chapter, God willing, sufficiently demonstrate. The motion therefore most called in question, and most likely to be found in the Earth rather then in the Heauen, is the Diurnall Revolution performed in 24 shoures from West to East: which (as we have proved) being given to the Heavens would be farre swifter then nature can well suffer : wherefore with more probability may this motion be taken from the heavens, and given vnto the Earth: The other without any abfurdity at all may be granted in the Heauens: Sith no repugnancy is found in nature, but that every heavenly body may be furnifhed with fome motion; and therefore C permicus might have granted the Sunne and fixed Starres their fenerall motions as well as the reft, which would have seemed farre more probable then to have endowed the Earth with a Triplicity of motion. These things being thus opened, I will set down their Theoremes.

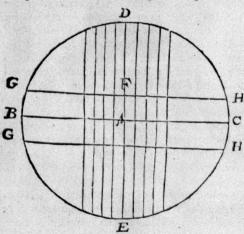
The Terrestriall Globe is the Center of the whole world.

To ynderstand aright this proposition, we must consider that a Center may be taken two manner of waies: either Geometrically, or Optically: In Geometry it is taken for an imaginary point, conceived in a magnitude devoyde of all quantity, yet bounding and termining all Magnitudes: Optically it is viually taken for a smal and insensible Magnitude; because to the fight it may seeme no other then a Point; In which last sense we may call the Earth the Center: For although the Earthly Spheare is endowed with a great and maffie substance, yet (as we shall hereafter demonstrate)in respect of the Firmament this greatnes would vanish into nothing. For if a man standing in the Firmament should behold it, it would seeme no other then as a small point. This being declared, we will produce these reasons to proue the Earth to be the Center of the Vniuerle. The Center, I fay, not of al heavenly motions (for some Starres are moved ypon their owne Center) but of the whole heavenly machine being colle-Cliuely taken as one Body The first argument is of Aristotle. taken from the grauity or natural linclination of all heavy bodies to the Center. The Earth (faith he) being a heavy & maffie body, must needs seeke the lowest place, which is farthest off from the Heavens. But this can be no other then the Center or middest point of the whole world. Which argument by others is more subtily vrged in this manner. Suppose the whole masse of the Earth were cut and divided into many parts, equall the one to the other, of the same waight and figure : which parts fo divided were placed in divers places under the concave Superficies of the Moon, that they might be freely left to themselves to move according to their naturall inclinations: It is most certaine that all their parts being of the same nature, waight quatity, and figure, would descend with the same motion . & in the fame equal time, to the fame place; which could in no wife happen, except they should concurre in the Center of the world. But this reason, for ought I viderstand, is only probable, and not backt with any necessary demonstration. For it proues not

thing else but the Earth to be the Center of all earthie and heavy bodies, and not to be abtolutely placed in the exact middle of the world. Another reason not much vnlike the former, is drawne by fome from a finall cause, and the naturall harmony of the parts of the world, one with the other: The Earth (fay they) is of all other bodyes, the most vile, and fordid: Therefore it is agreeable to nature, that it should be placed in the middle, equally distant from each part of the Heauens, that one part might not feeme to complaine of this vnpleafing vicinity more then another: But this reason takes as granted two marcers, as yet not decided. First, that the Earth, amongst all other bodies, is most vile and fordid, depending on the ground of Pcripaticks, that the heavenly bodies suffer no corruptio, a thing fooner spoken then proued. Secondly that pure and impure bodies, the most excellent and most vile in nature, are alwaies most distant, as in nature, so in place: which is a peremptory asfertion without ground. A third reason more probable then the former, is drawn from the apparences of Starres about the Horizon: It is manifest that the Starres about the Horizon appeare alwaies to be of one, and the felfe-fame magnitude. & quantity, whether in the verticall point, or in the East, or the West, or any other place : whence wee may collect that they differ equally in diffance from the Earth, and by consequence the Earth is feated in the middle of the world: for if it were otherwise, that the Starres in some place should bee nearer, in other farther off, they would some where sceme greater, otherwhere leffer, according to the grounds of the Opticks. This reason, howfocuer popular, icemes to admit a two-fold exception. First, because it implies that a man standing on the superficies of the Earth is equally distant from all places & parts of the Heavens, wheras the heavens in the Horizon are farther distant, by reason of a whole semediameter of the earth interposed. Secondly, all Starres arising in the East, or setting in the West, ordinarily seeme greater then in the Verticall point, by reason of vapours ascending and interposed. Whence wee cannot well gather the Earth to be feated in the middeft from the like apparence of the Starres, when experience teacheth the co-

trary, that they seeme not alwaies of the like magnitude. Concerning the first, we answere that the Semidiameter of the earth interposed betwixt the Superficies and Center, is in it selse greater. But this (as we shall prone) in respect of the Heavens is fo little that the fense cannot gather any difference in observation of the Starres, but that they should alwaies appeare of the like magnitude. Concerning the fecond, we must needs acknowledge that vapours ascending about the Horizon by an Opticall Refraction, make the Starres feeme greater then other wife they would doe, But the reason may be understood in this fort: that whether a man be placed in the same Horizon where the Sunne is when he rifeth, or under that Horizon where the Sunne is now under his Meridian, or under that horizoniwhere he is fetting, hee will appeare to be of one and the telfe-fame greatnesse without any sensible difference. Whereas therefore they speake of the appearance of Starres, they would have them taken as abstracted from all impediments of fight or interposed vapours, and so the reason may obtaine hir force. The fourth reason why the earth should be seated in the midst, alleaged by Ptolomy, & others is this: wherefoeuer any man stands on the Surface of the Earth, fix fignes of the Zodiacke will shew thefelues, and the other fix fignes will lye hid; and by confequence halfe the heavens will appeare, the other halfe will bee vinder; which is an euident reason that the Earth is in the midst, for otherwise it could not so happen. The former is confirmed by Ptolomy, Alpraganus, and the best Astronomers: the consequence may be inferred out of naturall reason. This argument will sufficiently hold upon this supposition mentioned before. and to be proved hereafter: That the Earth having no fenfible magnitude in respect of the Firmament, no sensible difference can shew it selfe betwixt the Sensible and the Rational, Horizon. Besides these reasons, which make the matter more then probable: others are produced by Ptol my demonstrative, not admitting any cuident or probable exception or cuasion. The first is this; If the Earth bee placed out of the Center of the world, it must have of necessity one of these three Sites or positions: Either it must be in the plaine of the Equino diall or

at least it must be placed, not onely without the plaine of the Equinoctiall, but without the Axeil-tree: That is, to expresse it plainer; It must either be placed beside the Axell-tree, yet x-qually distant from both the Poles; or else it must be on the Axell-tree, and so consequently never to one Pole then the other: or thirdly, it must needs be beside the Axell-tree, yet nearer to one Pole then another. If the first position were admitted, these absurdates would of necessity follow. First, that in a right Spheare there would happen no Equinoctiall, but onely in that Horizon which passeth by the Center of the world: for example sake; let there be imagined a Spheare, B D C E, whose



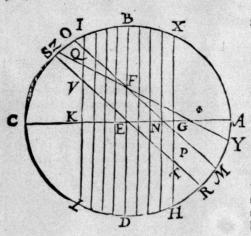
Center is A: let the Equator bee DF: the Axel-tree of the world BC: and let the Earth be H in F, the right ~ Horizon HG not paffing 11 by the Center of the world which shal be parrallell to the Axis BC: fince the Æquatour cuts

the Horizo in right angles; It is most manifest that not only the equatour, but other parallels of the same wil be vnæqually divided of the Horizon: forasimuch as it passeth not by the Center or the Poles of the world: wherefore it must needs follow, that the daies must cotinually be vnæqual to the nights: which contradicts all experience; because in a right Spheare the daies are alwaies found to be æquall to the nights. Secondly, out of this position it would followe, that no man in a right Spheare should

should behold the halfe or hemispheare of the heavens, but either a greater or leffer part, as may be demonstrated out of the fame Diagramme, whereas fense can testifie that fix fignes of the Zodiack are alwaies conspicuous aboue our Horizon, and the other fix alwaies hid : onely excepting that Horizon which paffeth by the Center of the Earth, wherein the Mediety of Heauen is conspicuous. Thirdly, the same Starres in a cleere aire should not alwaies seem of the same magnitude; for if the earth be placed in the Æquinoctiall plaine, and befide the Axis of the world toward the Zenith or Meridian; the Starres which are in the Meridian will appeare greater then in the East or West. because they are nearer. But if it be placed neere the Nadir or midnight point, they will appeare greater in the East or West, then in the Meridian: if it should be placed towards the East or West, the Starres would either seeme greater in the East then in the West, or contrariwise, greater in the West then the East: all which plainely contradicts experience. Moreouer it would hence follow out of this last, that the fore-noone would not be aquall to the after-noone, for a fmuch as the Meridian circle paffeth by our verticall point, which in this case cannot bee in the middle of the hemispheare, but will decline more, either to the East or the West. Fourthly, it must needs follow that in an oblique Spheare, either there wil be no Æquinoctiall at all, or at least if there were any it would not be in the midst betwixt the two Solftices of Summer and Winter; which is against all common experience. To explaine which affertion, let there be a Spheare ABCD, whose Center shall be E: wherein wee will conceine the aquatour to be BD: the two Tropicks IL, and XH: the Axel-tree of the world A C: Now if the Earth should be placed in the plaine of the æquatour, out of the Axis of the world, as in Flet there first be an oblique Horizon Z FY, cutting all the parallels into vnæquali parts, and the Axis in those parallels which are without: it is manifest that in the faid Horizon there will be no Aguinoctiall; because the Horizon xqually divides in two halfes only that parallel which is described by P, which nevertheleffe the Sunne neuer comes ynto, as neuer going beyond the Tropicke XH: Let there bee another oblique

GIOGRAPHIE. The firft Booke.





oblique Herizon OFM cutting the Axell within the faid parallells in N : Ic is manifest by reason, that there wil hap pen an æquinoctial in the faid Horizon when the fun shal describe the parallell by N:becante this parallell

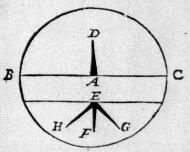
is by the Horizon divided into two aquall partes. But this can in no wife happen in a middle space and time betwixt the two Solftices, forsimuch as the Æ quatour only is aqually di-Rant and removed from either Solflice. It is also manifest, that the Sunne residing in B D the aquatour, there can be no aquinoftiall, but either after or before: which is abfurd and oppofite to observation. Fiftly, it will bee inferred out of these grounds, that no Horizon shall divide the Heavens into two aguall parts befides that which concurres with the aguinoctiall circle, as B D, and fuch as are drawne by B D. Wherefore all people should not behold the one halfe of the heavens. Sixtly, out of this opinion would necessarily be concluded, that the excesse of the greatest and longest day about the aquinoctiall day, should not be aqualized by the defect of the shortest day. by how much it is exceeded by the aquinoctial! day : which is against a'l common experience; the consequence shall appeare by demonstration. Suppose A to be the Artick Pole: then will PG be the excesse of the longest day X P aboue X G the Aquinoctiall day. But K Q is the defect wherein the shortest day IQ

I Qis exceeded of the Aguinoctiall day IK. All these absurdities are avoided, if we put the Earth in the Center E. for fo in every oblique Horizon, as in SR, will be an Equino Siall, the fun refiding in the Equator. 2 The Heavens will bee divided into two equall halfes, and P G the excesse of the longest day, wil be equall to K V, the defect of the shortest day : whence wee may conclude the first part of this argument, that the Earthis not befides the Axis in the plaine of the Equinoctiall. Concerning the second position; if we should place the earth in the Axis of the world out of the plaine of the Equinoctiall, as many, or more absurdities would of necessitie follow: for example sake, let it be imagined in P: First then no Horizon beside a right would cut the Heauen into two equal parts or halfes, and confequently the Zodiack. But this is proued false by experience (as wee have shewed) because fix fignes of the Zodiack are alwaies aboue and conspicuous, and the other fix vnder. Secondly onely under a right Horizon would there be an Equinoctiall, because only fuch an Horizon equally divides the Equatour into two halfes, as may be seene in the former figure, in which the Equatour is conceaued to be BD: the right Horizon AC. the oblique Y Z, cutting the Equator in F into two vnequal parts: Now if it should happen that in any oblique Horizon, there should be an a quinoxe, it could no wife be in the middle time betwixt the two Solflices, but would be much nearer to the one then to the other; as if the Earth were placed in N, betwixt the Tropick XH, and the Equatour BD, there would bee an equinoxe, when the Sunne paffeth in the parallel! by N. which parallell is farre neerer to the Summer Solffice, then the Winter Solftice. But if the Earth were in G, there would happen an equinoxe iust in the day of the Summer Solstice; all which are most absurd, and most repugnant to common sense. Thirdly, this granted, the whole order and proportion of increase & decrease of daies and nights, would be confused and troubled. It is agreed on by confent of all Cosmographers, that every where without the right Horizon, there is such an order and proportion of the increase and decrease of the daies & nights, that twice in a yeare the daies are equall to the nights, to wit, in the mean,

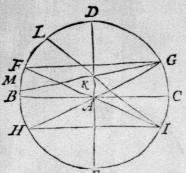
or middle betwixt the longest & the shortest day, that the longelt day is equall to the longest night, and the shortest day to the shortest night. That the excesse of the longest day about the Equinoctiall day, is so much as is the detect of the shortest day in regard of the faid Equinoctiall day. All which and many more such Apparences would be interrupted, were the Earth placed any where elfe then in the Center E, as will appeare by the Scheme. For the Earth being placed in E, every oblique horizon, as S R, will divide the Equatour B D, into two equal hemicircles, fo that fo much shall appeare aboue as lies couched under, and so that day will be equall to the night. In like fort the Tropicks HX and IL will bee divided into two vnequall paris, yet so as the Alternate segments shall bee equall, to wit, P X and V L, also T H and V I, as it is demonstrated by Theodofin, lib. 2. prop. 16. Whence it comes to passe that the longest day X P is equal to the longest night L V, and the shortest day IV is equall to the shortest night H P. Finally, P G, the excesse of the longest day XP aboue the Equinoctiall day XG, is equall to K V the defect of the shortest day under the Equinoctial day I K, which is shewed out of the similitude and equality of the Triangles TEG, and VEK. Now of the contrary parts, if the Earth should be placed in the Axis without the Center E, as in P, beyond all the parallells, no equinoxe can bee in an oblique Spheare(as we have shewed) but alwaies the daies will be longer or shorter then the nights. But if the earth bee placed in the point G, by which paffeth the last of the parallells, there will be one only equinoxe, and that in the Solflice in an oblique spheare in all other parts of the yeare the daies would either be longer, or else shorter then the nights. But if the Globe of the Earth be feated within the parallells in the point N, there would bee two Equinoxes in a yeare, wherein the spaces of daies and nights should increase and decrease. Neuerthelesse these increments & decrements should neither in number nor in greatnesse be equal to the increments and decrements of the nights, as may bee gathered very eafily by fenfe, comparing the two Triangles DNG, and QNK, because that more and greater segments of parallels are comprehended in the Triangle LNK, then in the Triangle PNG.

PNG. Fourthly, if the Earth should vnequally respect the Poles, and were not placed in the Center, the shadowes of Gnomons erected which make right angles with the Horizon, should not be cast directly forward in one right line in the time of the Equinoxes: the Sunne exactly placed in the East or West: as for example: let the Earth be A, seated in the plaine of the E-

quinoctial circle B C and let there bee a Gnomon erected on the plaine of the Hor zon, which is represented by the circle B C: It is manifest to sense that the sun setting in C, the shaddowes will be cast in the opposite part towards B. Likewise



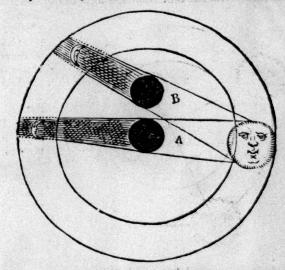
the Sunne rifing in B will cast his shadow towards C. But A C and A B, concurre in one right line, which plainely demonstrats vinto vs, that the earth is feated in the plaine of the Equinoctiall. But if it were placed out of it towards either fide, as in E, if a Gnomon be fet vp on the Horizon as E F, wee shall fee that the Sunne rifing in B in the time of the Equinoctiall, the shaddows will be directed by the line E G, likewise the Sun setting in C, the shaddow will make the right line E H: But these two right lines being produced, will cut one the other in the point E, and therefore cannot concurre in the same right line, whereof ordinary experience witnesseth the contrary. Fiftly, if the Earth were thus placed, it would follow by necessary consequence, that two fignes of the Zodiack diametrally opposite, should not be seene by a Dioptricke instrument: which is against experience which witnesseth that the rising and setting of the Sunne, may be seene by one right line; also the rising in the Summer Solstice and the fetting in the Winter Solffice, to answere to each other in one right line in euery Horizon: which could not be performed vnleffe the Earth were in the Equinoctiall plaine and the



Center. Let there bee an Horizon BD CE, the E-quator BC, the Axel-tree of the world DE, the Tropick of Cancer FG, of Capricorne HI. Let the Earth first bee placed in the Center A: here may plainely bee perceaued that the Equinoctiall East B, and the Equinoctiall West C, answere and concurre in the right line BC:

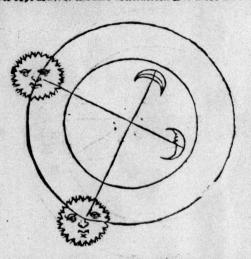
also that the East point of the Summer Solftice F, and the West of the Winter Solffice I, to concurre in the same right line FI. also the Winter East point H, and the Summer Westerne point G, to answere mutually one to the other by the same line GH. Which Apparence is confirmed of all Astronomers. Now let the Earth be fet in the Axis out of the Equatour in K: It is manifest to sense that the contrary will alwaies happen: For the Winter point of the Sunne fetting I, by a right Lne drawn from the Earth, will not directly answere to the Summer point of rifing F, but to the point L. Likewise the Winter point of Sunnefetting G, will answere to the point M, and not to the Winter rifing H. Whence we have sufficiently demonstrated this fecond position of the Earth beside the Center of the World to be inconvenient, and no waies to be defended. For the third pofition that the earth should be so removed out of the Center, as that it should neither be in the Equino Stial plaine, nor yet in the Axell-tree. We need produce no other confutation, then what we have said before of the other two positions. Because out of this, the fame or greater abfurdities would follow, then of the other, as any man may eafily understand out of these demonfrations we have before recited. The second demonstrative reafon, where with Ptolomy would confirme the Earth to be in the Center is drawne from the Ecclipse of the Moore in this manner. If the Earth were not in the Center of the World, there would

would not alwaies happen Eclipses of the Moone, when the two greater lights are diametrally opposed, but sometime they would happen when these great lights are not residing in opposite places of the Zodiack; which is false, and against experience; for all Astronomers have witnessed, that eclipses of the Moone then only are seene, when the Sunne & the Moone stand direct-



ly opposite the one to the other: because then is the earth directly interposed. Now let the Center of the world be A, in which if the Earth be placed, it is manifest that it then happens when the Sunne and the Moon are exactly opposed, and the Earth interposed directly, which in this case cannot otherwise happens But if the Earth be placed beside the Center of the world, as in B. These things may fall out, that the two Luminaries may reside in two opposite points of the Zodiack, and yet cause no eclipse; because the Earth is not in the same Diameter by the which they are opposed. Also the Moone will sometimes suffer an Eclipse, when she is less distant from the Sunne then a semi-

eircle. In a word, this eclypse is in places opposite. A semicircle will then only be seene when the Diameter of opposition shall passe by the Center of the Earth, and the world; all which are manifestly repugnant to experience and observation. Out of this demonstration of Pictomy, Clavim, a later Astronomer in this fort drawes the like conclusion. Let there be observed two



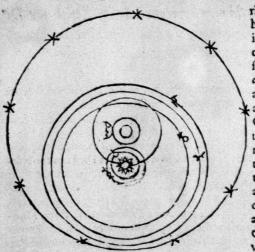
divers eclipfes of the Moon in diverse places of the Zodiack: Now because each Eelipfe hapen'd whe the Sunne and the Moone were opposed the one to the other, in one Dia-

meter (as experience and Astronomicall supputations warrant) it must necessarily be concluded that the earth should be in each of those Diameters, and so by consequence in the common section of them both: Sith then all the Diameters of the world courre, and cut one the other in the Center: it must needs follow that the Earth should be in the Center and midst of the World. Diuerse reasons there may be drawne to proue this affertion. But these demonstrations of Ptolomy, as I have set them downe enlarged, and explained by our later writers, may seeme sufficient, especially in a matter of sew called in question.

3 The Position of the Earth in the Center of the

VV orld may be reconciled as well with the Diurnall motion of the Earth forementioned, as apparences of the Heauens.

That this proposition may the better bee vnderstood, wee are first to set downe in a Scheme, or Diagram, both the number and order of all the heavenly Orbs, conceived according to our grounds. Secondly, we must shew in particular, how this ranging of the heavenly bodies is capable of all the motions, and apt to fatisfie the apparences. In which parts I wil not too nicely descend to Astronomical curiosities, being too many & subr tile for a Geographer to discusse. Only I will give a tast, to satisfie such as suppose no midd'e way can be troden out betwixt Ptolomies stability of the Earth, and Copernicus his three Motions, I might feeme perhaps prefumptuous beyond my knowledge, to reject and paffe by the draughts & delineations of Pro-Tomy, Alphon fu, and their followers, which are commonly defended and in vie: or that other of Copernicus, Supported with the authority and credit of fo great an Aftronomer: or that of Tichobrabe more corrected then either, and to preferre my own, being an Embrion, or halfe fashioned. To this I answere. First. that I only expose this Scheme following to the view of the iudicious, nuftifying it no farther then will fland with Aftronomicall observation. Secondly, I herein arrogate little or nothing to my selfe; forasmuch as I have digested, and compounded it out of the observations and experiments of late Astronomers, and only collected together what they scattered; The Scheme it felfe is expressed in this manner; wherein to beginne from the lowest: The Center is the Globe of the Earth, to which wee haue giuena Dimmall motion from the West to the East vpon her owner Poles, whose Revolution is made in 24 houres: About the Earth as the Center of the whole world, the Moone is carried in her circle, which amongst all the Planets, is found more neerely to respect the Earth, as well in place as mature. Next succeeds the Sunne, as the leader of all the Planets, which car-



ried round abouttheearth in an Annuall circuit. defcribes the Ecliptick circle: about the Sun as the proper Center, are all the Planets moued except the Moon. The two immediate companions of the Sum are Venus, & Mercurie . which fo co-

paffe him about, that the Earth neuer comes betwixt them and the Sunne. The other three Planets, as Mars, Iupiter, and Saturne, howfocuer they enuiron the Sunne as their proper Center, yet so as within their circles, they comprehend the body of the Earth: The Planet Mars, because he is found by Astronomers, to moue sometimes aboue, sometimes voder the Sunne, is understood to moue in fuch a circle, which on the opposite fide shall cut the circle of the Sunne: yet so as Mars and the Sunne can neuer meer in one point : Forasmuch as Mars, as well as the other Planets, is supposed to be carried in an Epicycle about the Sunne, and to keepe an equal distance from him how soeuer moued: Neither is he eyer found vnder the Sunne, but about the time of the oppolitio, as Astronomers obserue: whence a cause hath beene given, why Mars should appeare greatest at the time of Opposition. These five Planets, to wit, Saturne, Inpiter, Mars, Venus, and Mercury, may bee confidered according to a double motion: The one is proper and naturall, wherein they are moued about the Sunne, as their proper Center: The other Accidentall, and as it were by a confequence of Nature, where-12312 by

by in their circuit mouing about the Sunne as their Center, they must of necessity, by a consequent site of the place, be carried about the Earth. For the Sunne placed in his Eclipticke line, fo compaffeth round the Earth, that with him hee is supposed to carry the Epicycles, wherein thefe Planets are moued round about him. Whence we finde the motion of these Planets about the Sunne, as their owne Center, to be regular, but about the Earth irregular: which proceeds from their Excentricity in respect of the Earth. About all the Planets we place the Firmament, or Starry Heaven, having a very flow motion, not to bee finished in many thousand yeares, and this motion is on other Poles then the Poles of the world, to be fought out in or neare the Poles of the Eclipticke. This Heaven would Aristotle have to be the first moveable, and therefore gave it a very swift motion, which is the fame which we call Diurnall, and have given to the Earth. But it feemes more consonant to nature, that the flower motions should agree to the higher bodies : and the fwifter to the lower, that their might be a proportion, betwixt the time and the space of motion: It remaines that wee probably shew that out of their suppositions, the Coelestiall Apparences may bee as well or better falued then by the ordinary grounds. The Apparences which are most called in question, concerne either the Motion, or the Places, and Politions. All the rest are either of lesse momet, or at least are therevnto reduced. Euery motion which is found or thought to bee found in the Heavens, is either the Dinrnall, or Periodicke. The Dinrnall Motion (as we have already shewed) belongs to the Earth, which according to our grounds is supposed to move from the West vnto, the East in 24 houres, Which may answeare to the Motion of the first moueable Spheare; which according to Aristoile, is the Starry Firmament, and thought to moue from the East to the West. The Periodick Motion, is either a flower Motion, to be finished not vnder many thousand yeares, or else a swifter Revolution of the Planets. This flow motion the common Astronomers would have twofold: The one from the West to the East on the Poles of the Eclipticke: the other a Motion (as they cal it) of Trepidation, from the South point to the North

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and backward againe; but one flowe Motion of the fixt Starres vpon the Poles of the Eclipticke, granted to the Firmament, will (for ought I fee) fatisfy both. The reason why they put two diffinet Motions is, 1 Because they have observed the Starres of Aries, Taurus, and the rest of the Zodiacke, not to bee seated in the same place wherein they were anciently found; but to be moued certaine degrees from the West towards the East. Whence they would conclude a Motion to bee from the West vnto the East. 2. It will stand with no leffe experience, that the foresaid Starres of the Firmament have moved themselves fre the South towards the North. To passe over the rest, the Poleflar, which in Hipparchus time was distant from the Pole about 12 Degrees, is now observed to approach almost three degrees. These two Motions, should they be esteemed in the account of Aftronomers might seeme deficient. Notwithstanding we may probably coniccture this to be no other then one, and the felfefame Motion vpon the Poles of the Eclipticke: Whence it may come to passe, that the fixt Starres are not only carried from West to East, but also by reason of the obliquity of the Eclipticke line, encline more & more dayly to the Pole of the World, whence they may agains seturne. For this Motion from the West to the East, is of the primary intent of nature, wherein the Starres moue in circles parallell to the Eclipticke: But from the North to the South, as by the necessary consequence of the pefition and obliquity of the Zodrack : because it cannot be avoided, but that it should either incline to, or decline from the Pole. If they should object (as many doe) that this progresse is not proportionall in respect of the time according to the calculation of the Astronomers. Wee answere. 1. That this difference is fo small, that it should rather seeme to be imputed to the negligence or ignorance of fuch as tooke these observations, then to any diverfity of motion. For who knowes not in these daies of ours, whereinthis art is arrived at a farre greater perfection, diverse Astronomers in obseruing the same Star at the same time. to differ much the one from the other : Whole knowledge notwithstanding, is fortified with the experience of the Ancients, and invention of new Instruments. What then shall we thinke of

of those, which diffant so many ages in time, and vsing diverse & valike Inftruments in their observations, have differed in matters of so small moment: chiefly in seeking out the period of this long and flow motion, which by reason of his slownes, since the time it was knowne to man, hath not ranne the fifteenth part. of his circle. For my part, I shall rather ascribe it to the errour of their observations, then multiply Orbs without a greater caufe. First, because (as we have faid) the difference is so small, & almost insensible, 2. Because we have beene raught by our Astronomicall histories, what kinde of Instruments were then in vie, which to later Aftronomers have beene thought too rude and vofit to make such subtile observations. Lastly, concerning the Site and Position, no leffe reason may bee given out of our Hipothesis, then the common way. For by placing the five Planets to runne in their Epicycles about the Sunne, may we give a reason of the inequality of their distance from the Earth, wherein an ingenious minde in our common grounds can hardly give himselfe sufficient satisfaction.

The stabilitie is an affection whereby the Terrestriall Spheare is firmely setled in his

proper place.

The Stability, or firmeneffe of the Earth which wee here vnderstand, I. No way denies or contradicts the motion of the parts of the Earth, whereby being separated, they returne to their proper place, 2. Neither the circular Revolution of it on her owne Poles and Axell, whereof we have formerly spoken. But either fuch a motion whereby the parts of it may bee feuered one from the other, and so the whole Masse dissolued; or whereby the Center of the Earth may be moued out of his proper place; or at least such as might mooue the Poles of the earth from their true verticity, whereby they should not respect alwaies in the Heauens the same points or poles. Which kinde of stability from motion we will establish in this Theoreme.

The Earth is firmely seated and settled in her

proper place.

This Theoreme may be proued as well by reason, as authority of holy Scripture: From reason it is demonstrated in this maner. If the Earth should not be setled in her proper place, this would of necessity happen; either by dissolution and separation of the parts one from the other: or by removing the poles out of their fixt places: or else by motion of the Center from one place to the other. The first cannot be admitted; because (as we have before taught in the second Chapter of this booke) All Terestriall Bodies are endowed with an inclination or ponderofitie to approach as neere as they can to the Center of the Earth; fo that by this coherency and conformity, the whole earth is ranfom'd from any such mutability. Neither can the whole Spheare bee diffolued without an especiall miracle: And if so it should happen, the parts would return againe, and conforme themselues to compose the same Spheare. Likewise the second way; The earth cannot loofe her stability, because (as wee have shewne in our former Chapter) the earth hath her two Poles magnetically made fast vnto the Poles of the world, as if they were bound firmely to two great pillers, neuer to bee shaken. Finally, The Center of the Earth cannot be moved out of his place any wife, because, as we have demonstrated in the Chapter before, without the disturbance and inversion of the whole frame of Nature the Earth can have no other place then the Center or middelt of the whole world. Some have alleaged as an argumer that principle of Aristotle: That one simple Body can have but one simple Motion: and therefore the earth challenging to it selfe a right motion to the Center, cannot also have a circular or round motion, and so of necessity must rest vnmoued in her proper place. But this reason, as I have shewed, is weake to proue this affertion. First, because this principle of Aristotle is not grounded on certainty, but contradicts experience, as I have elsewhere shewed. 2. This right motion to the Center is not to bee ascribed to the whole, as the immediate subject, but to the parts of it separated from the whole; so that nothing will hinder, but that the whole Globe may have a motion proper to it selfe on his owne Poles. But to let this reason passe as weake; all those argumen's alleaged by the common Aftronomers, and Philosophers against

against the circular motion of the Earth prove indeed no other matter then this stability which we establish: but if racked any farther come short to satisfie. For authority of Scripture, many places are viged to prove this stability; whereof wee have a pregnant place in 104 Psalme, wherein Dawid magnifying the Creator, saith That he laid the foundation of the Earth so sure, that it should not be moned at any time: To which may bee added many other Texts, but that I hold this one sufficient in a matter which sew men call in question. Wee are in the third place to treate of the proportion of the Earth, with the heavenly bodies.

The Proportion is that wherein the quantitie of the Terrestriall Globe is compared

with the quantitie of the Heauens.

We must here remember a distinction before touched, that the Globe of the Earth may be confidered two waies; either Abfo-Intely in it felfe, or Comparatinely in respect of the heanenly Bodies. If we confider it absolutely in it felfe, wee shall finde that the Earth hath a vast and huge magnitude, and not any waies to be compared to a point; because it is a body, and therefore. Subject to division, whereas a point is conceased as an indivifible figne admitting no parts at all. Secondly, because the magnitude of the Earth many times taken, wil measure the greatnes of the Heauens, as we may observe by Astronomers who meafure the magnitude of the greatest Starres by Dianeters & Semidiameters of the Earth: whereas a point of it beeing a thousand times multiplied, will never beget a magnitude or measure of the quantity of any Body. Thirdly, the Starres are not as meere points in respect of their Orbs, because they sensibly are seene, as parts of these Oibs. But the Earth is greater then force of the lower Starres, as the Moone: Whence we may with good grounds averre, that if a man were placed in the Moone, he might behold the Earth farre greater then the Moon being observed by vs in the Earth. Wherefore no man can deny but the Earth in it selfe hath a great vastoesse. But if we confider this greatnesse in respect of the Heauens, we shall find this raft greatnesse to shrinke almost into nothing, and become as a

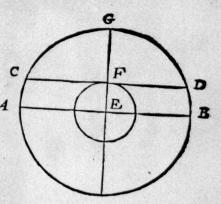
meere point without sensible magnitude. But this is not altogether generall without limitation; because the heavenly bodies are distinguished into the higher and greater, such as are the Firmament with the source higher Plannets, such as are Saturne, surpiter, Mars, and the Sunne: or the lower and desser, such as are Venus, Mercurius, and the Moone, which difference in place and greatnesse admits a great diversity in this proportion, as wee shall shew in these two Theoremes.

The Earthly Globe compared in quantity with the Firmament and Superiour Orbes of the

planets, hath no sensible magnitude.

This Proposition is supported not only by the authority of many and grave Authors, as Aristotle, Ptolomy, Pliny, Alphragan, and others: but by divers ftrong reasons drawne from experience and observation of Astronomers. The first argument shall be this, which is most popular. The Sunne and many other Starres in the Firmament, are found out by Astronomicall Instruments to be manifold greater then the Globe of the Earth: yet appeare they in respect of the heavens but as a little point or portion. Then must the Earth, being in comparison far lesfer, be devoyd of all fensible magnitude or proportion. Secondly, if the Earth had any notable quantity in respect of the Heaven, then mult the Diameter of the Earth haue as great a quantity in respect of the Diameter of the Sky; for there is the same proportio of the Diameters which the circumferences have one to the other, as is demonstrated in Geometry. Now if the Diameter of the Earth hath any notable magnitude in comparison of the Diameter of the Skye, then the Starres which be over our heads, be nigher vnto vs by a notable quantity, then when they be either in the East or West. For it must needs follow that the Starres placed in the vertical point, are necrer by the Semidiameter of the Earth, then when they are either in the Easterne or Westerne point, as we see in this figure here set downe ACDB, wherein I make E to be the Center of the Earth, A E B the true Horizon, and E F the Semidiameter of the earth. Now if the Semidiameter FE haue any sensible proportion, then must G

the verticall point be neerer to F. the either A or B. supposed to bee the east & west points; because E A, or E B. are the whole Semidiameter of A the Cæsestiall circle, whereof FG is only a part. But contrary wise there is no such diversity perceived in the magnitude of the



Starres, but that they appeare still to bee of one and the same greatnesse, except by accidentall interposition of vapours and groffe bodies: wherefore it must of necessity followe, that their distance is all one in all parts of the Skye, and by consequence the Semidiameter of the earth hath no fenfible divertitie in distance. Thirdly, hence would arise another reason no lesse forcible then this; that if the Semid ameter of the Earth had any comparison or proportion to the Semidiameter of the Skie, the Horizon that we have on the upper part of the earth, should not divide the Skye into two equall parts; for a smuch as the part which is couched under the Horizon, would alwaies be greater, and the other lefter, as in our former Diagramme : if EF have a notable quantity in comparison of E A: then will the line CFD, being the Horizon on the top of the earth, differ notably from the line A E B, being the Diameter of the World, and the Horizon to the Center of the Earth; and fo shall not the Horizon CFD, divide the world into two equall parts, but the vpper part shall alwaies be leffer then the lower, which croffes ordinary experience: for we may fee in long winter nights, that those Starres which are in the Fast Horizon, in the beginning of the night, will be in the West at the end of twelve houres : and contrary wife, those Starres which did fet in the West, whe those others

others did rife in the East, shall rife againe when the other shall set. Fourthly if the earth had any sensible greatnesse in respect of the Heauens, then were it unpossible for any Sunne Diall to be regular and observe due proportion. For wee see the shaddowes to move as duely and orderly about the Center of Dialls and such instruments, as if their Center were the very Center of the world: which could never happen if these two Centers should differ notably in respect of the Spheare of the Sunner to expresse it the better we will set this Figure, which represents the three notable circles in a Diall, which are described by the course of the Sunne in three notable places of the Zodiacke, to wit, the two Tropicks, and the Equinostiall. Herein the utter-

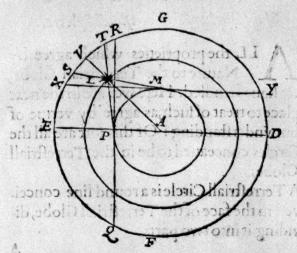


most arch B L Crepresents the Tropicke of Capricorn, and is described no greater then the quarter of a circle, because the Sunne placed in the Signe, shines vnto vs but six houres. The Equinocatiall is set as halfe a circle, because the Sun being in it, appeares vinto vs 12 houres, & is here noted out by E I F. The Tropicke of Cancer containes 3 quar-

ters of a Circle, because when the Sun is in it, there are eighteene houres from Sun-tising to Sun-set: & that circle is GHK. The Center of the Diall is A, and the Style which gives the shadow DA, whose top being D, doth describe those portions of circles with such exactnesse, as if the Diall were set in the very Center of the Earth, and the distinction of the houres shewes it selfe no otherwise then if the Center of the Diall were the same with the Center of the world. To these arguments I may adde, that if there should bee a sensible greatnesse of the earth in respect of these superious Orbes, either all or most of these absurdities would arise which follow their opinions, who place the Earth out of the Center of the World, which we have before treated of.

2 The Terrestriall Globe compared with the inferiour Orbs bath a sensible magnitude.

Although the whole Earth compared with the Firmament and superiour Orbs of the Planets, seeme no otherwise then a point: yet from this we must except the Orbes of the lower Planets Venne, Mercury, but especially the Moone: Who are found by observations of dwerse skilfull Astronomers to have a fensible and norable greatnesse in respect of the earth, whereof a manifest argument may be drawne from the Parallax or variation of the fight wherein our obsernations of the same Starre at diverte places are not the fame, though at the fame time: neither wil fuch a Starre so both places feeme in the fame point of the Heavens; which could not possibly be except wee admit a lenfible difference betwirt the Rationall and Senfible Horizon; and fo grant the Earth, in respect of such Ochs, some quantity and greatnesse. This diversity of Aspect, which they call the Parallax may be seene in this Figure let A be the Center of the Earth, L the Moone, or other Scarre to be observed.



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EGD;

- EGD, the Firmament or Orbe of the fixt Starres: Suppose then the eve to be in the fixt point M of the sensible Horizon XMY the faid Planet will appeare in the point of the Firmament S, according to Optical principles, whereby all things are faid to be scene in the place directly opposite. Supposing agains the Eve to be in the point P of another fensible Horizon RPO, the Starre L will no doubt appeare in the opposite point T. Neither of which meets with the Starre in the right place. For imagining the Eye to be placed in the Center A, the place of the Starre would be V, which is his true place. These differences of fight could finde no place if the Earth were as a meere point and challenged no fensible Magnitude, in respect of these inferiour Planets: and yet experience of Aftronomers hath sufficiently confirmed it. But this being a point very curious, and appertaining to Aftronomy, I leave it to their farther industrie, whole profession it vndergoes.

CHAP. VI.

Of the Circles of the Terrestriall Spheare.

Nature to the Terrestrial Globe, we have handled. Here wee are in the next place to treat of such, as agree by vertue of our understanding: Of this fort are all the Circles conceaued to be in the Terrestrial Globe.

2 A Terrestrial Circle is a round line conceived in the face of the Terrestrial Globe, dividing it into two parts.

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A Circle is confidered two manner of waies; either abstrached from this or that fenfible matter, in which fort it is suppofed to be taught in Geometry; to which properly appertaines the knowledge of the Fabricke & Mesfare of all Magnitudes, especially of this, being amongst all, the most perfect & exact. Or elle a circle is confidered to far forth as it hath fome ground in the Nature of the Earth, at least by application of the Coleftiall Globe, and fo it comes into the confideration of Geographie. For conclusions demonstrated and proved in Geometrie. are here to be admitted as principles supposed not demonstra. ted a new: which Logicke, if Clavin, Blancann, and other fuch writers had well learned, they would not have stuffed out their worke with fuch Heterogeneall mixtures, but have reduced every thing to his proper feat and science. A circle as well by the Geographer as Astronomer is divided into foure quadrants each quadrant into 90 degrees, all which make vp 360. So that a degree is the 360 part of a Circle, which I only mention as being of chiefest vie with vs yet supposed to be handled and taught in a higher science.

1 A Circle though imaginary in it felfe, bath his ground in the Nature of the Earthly Spheare.

As in Logicke men haue invented certaine Intentionall Notions, serving as so many instruments to direct and regulate our vinderstanding in the apprehension of things: So in Cosmographie can there not be wanting such imaginary signes and circles to confirme and ayde our phantasic. And as in Logick such Notions in themselves are meetely imaginary and intentional, yet may be tearmed reall, so farre forth as they are grounded in the things themselves; so may we speake of these circles conceived in the face of the Terrene Globe; which wee are not to conceive to be sections and imaginary, as if they had no ground at all in nature. For although there be no such circles painted on the face of the Earth, as we finde in an artissicall Spheare: yet must we of necessity conceave such reall respects to bee in the Earth it selse: as when a Ship sayles over the Ocean, it cannot be said to leave behind any visible marke or Character in

the idriace of the water; yet in regard it made a reall pullage, it will leave a line concernable figuring out various and true parage. It is a manage which has hence little croubled Colinographers, to finde joins be immediate and true subjector ground of these circles; whether they should be immediatly taken from the carth, or else in the Heavens. The ancient Cosmographers have acknowledged no other ground of these Circles; then the conjunity and application of the celestalised look, & he parts with the parts of the Earth; but our Magnetical Philotophers most nearly searching into the nature of the Earthly Spheare have found these Circles all sexcept the Horizon) to wit, the Chericists, and Parallells ito be immediatly, grounded in the Earth it selles whose opinion we cannot receding supported by experimentall demonstration, as wee shall show in particular.

The distinction of a Circle into any certaine Number of garts hath no certaine ground me the Nature of the Earthly Spheare, but only in conveniency; leaving our judgements free, to take such a Number as may best serve our purpose.

Some Aftronomers more curious then wise, have gone about to seeke a ground of this distinction of a circle into 360 parts out of the Sunnes course in the Zodiacke, a Circle (say they) by the opening of the Compasse, being described in a plaint, is divided into fix equall parts. Now because the Sunne being the rule and measure of all perfect motions, passeth through one fixt part in 60 daies, the whole Circle was divided into 360, for 60 multiplied by 6, will produce that number. But this reason seems to infer nothing conforming any natural ground, that this distinction shall finde in the Earth, though it may serve as an argument of Conveniency, the number 360 being fixtest for that calculation. Another reason very like the former, is drawne from the conjunction of the Sunne with the Moore.

which happens 12 times in a years; and because from each coniunction to that which followeth are spent 30 daies; Hence it Is that the Zodiacke is first duided into 12 parts, which multiplied by 30 will produce 360. This reason likewise proves only thus much, that it is the fittest number : o calculate the Motion of the Sunne in his Ecliptick: Not that this division hath any ground in Nature more then other; because being a continuate quantity, according to Philosophy, it may suffer infinite diufions: for it was in the beginning left free to Colmographers, to choose what number they pleased to expresse the parts or fections of a Circle: which they tooke (as it feemeth) not meerely from the motion of the Sunne, but f om their conveniency, and commodity, finding this number most commodious for the diffinction of every Circle. The reason was becaufe no number could be found, which fuffered more parts & divisions then this. For a fmuch as in 6; whereof 360 by multipheation is produced, hathexactly these parts. 1.2.3.4,5.6. 10.12.15.20.30, Likewife 360 hathexaelly 1.2.34, 5.5.8. 9.10.12. 5.18.20.24.30.36.40.46.60.72.90.120.180. Of all which parts there is fo great vie in Aftronomy and many. times in Geography, that witho it it there would bee small exactnesse. For as weesee a yard measure would little steedthe Mercer or Clothier, except it were agame divided into smaller parts: fo falls it out in the account of the Cosmographer.

3 Of the Terrestriall Circles, some are Absolute, some Relative, the Absolute are such as are assigned without any respect to our sight; of which sort are the Meridians and

Parallells.

4 The Meridianis a circle drawn by the Poles of the world and the vertical point of the place.

The Meridian Circle is so called of Astronomers; because when the Sunsaccording to their suppositions) by the motion of the

first moueable comes into this Circle, it makes mid-day: and then hath beene running his course from his rising to arrive there just so long as he shall bee mouing from thence to the place of his fetting. In this Meridian are placed the two Poles of the Equator, which are the same with the Poles of the world. In this also are the verticall point and the point oppofite vnto it, tearmed the Poles of the Horizon, whereof wee shall speake hereaster. So that so many Meridians are imagined to be in the Earth, as there are verticall points: for howfoeuer we fee not many Meridians painted on the face of the artificiall Globe, yet must there be so many imagined in the real Earth as Zenithes and Horizons: so that it is impossible for a man to mooue never fo little from East to West, without changing his Meridian: yet for more order fake have the Colmographers reduced the number of Meridians to halfe the number of the degrees in a Circle, to wir, to 180, that every Meridian cutting the Equator, and other Parallels in two opposite places, should answere to two degrees in the same Circle. By which is appeares, that enery Meridian diuides the Terrene Globe in two halfes, whereof the one is respectively tearmed of the East the other of the West. But to avoid all ambiguity of speech, we ought to confider that a Meridian is twofold; either the true Meridian, or Magneticall Meridian. The true Meridian. ordinarily fo called is that which directly passeth by the Poles of the World; of which we here treat; which indeed (as wee shall shew is the only true magnetical Meridian. But that which some have fally called the Magnetical Meridian, is that which runneth by the Poles of the Magneticall Variation, and much differs from the true; because (as we have taught) the variation is diverfe according to the diverfity of places, & therefore cannot answere in any certaine proportion to the Poles of the Terrene Globe. The true Meridian Circle, as it hath-manifold vie in Aftronomy, namely to diftinguish mid-day, and mid-night, to measure the rifing and fetting of the Starres, &c. matters not to be neglected of Geographers; fo hath it a more speciall vsc in Geography: to defigne the longitudes and latitudes of the places, with their diffances, with many other matters treated of hereafter. Conknowe two things. The Invention of it, and the Distinction: The invention is whereby we are taught to finde out the true Meridian in any place assigned.

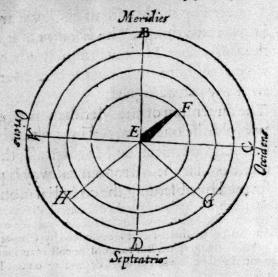
The Inuention of the Meridian is againe twofold: the one more Accurat, which is either Astronomicall or Magneticall, the o

ther Astronomicall or Magneticall, the or ther Popular the Astronomical way is performed by observing the coelestial motion.

The Meridian may be found out the Astronomicall way in diverse manners by Instruments deuised for this purpose by ingenious Artificers, whereof some are described by Gemma Frifium in his Cosmographie. But to auoid the cost of curious Instruments, I will set downe our way, depending on this Theorems.

If two severall Sunne-shadowes be observed, the one in the fore-noone, the other in the after-noone of the same dayexally to touch with their ends, the Circumserence of the same circle described in a Plaine, Parallel to the plaine of the Horizon: The line from the Center equally deviding the Arch of that Circle betwixt the two shaddowes, will be the true Meridian circle for that place.

This Theoreme, how so ever consisting of many parts, is notwith standing easie enough to be understood, being explained by an ocular demonstration. Let there be gotten a platforme of wood or metall, and placed evenly that it may lye parallell



with the plaine of the Horizon: Inthis plaine let there bee de-Scribed diverse circles from the same Center E. In this Center let there be rayled a Gnomon E F to right angles, so that the top of this Gnomon F, shall enery where bee equally distant from the circumference of each circle described in the plaine. which may eafily be knowne, because if it bee equally distant from any three points of any circles Circumference, it will also be equally diffant from all the rest alike, as Clavin hath raught in the 4 of his Gnomonicks. This platforme being thus ordered let the shaddow of the Gnomon be observed sometimes before Noone, vntil such time as it exactly shal touch the circumference of one of those circles, as in E G. Againe in the Afternoone let the shaddow be observed, till with his end it meet the circumference of the same circle, as in E H, which will happenso many houres afternoone, as the other before Noone. Thefe two points G and H, being diligently observed, let the Arch of the Circle GH be divided into two halfes with a line

lars,

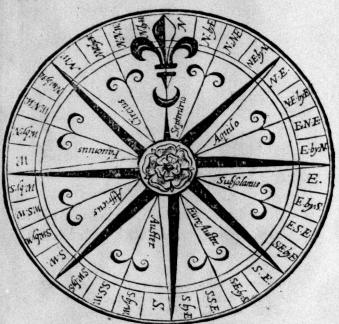
line drawne from the Center E, which shall be ED. This line ED will be the true Meridian for that place, on which when the shadow of the gnomon shall happen to fall, we may affure our selues that it is sull Noone.

7 The Magneticall Invention is performed by the Magneticall Directionie Needle.

This way is subject to much errour, and not so certaine as the former, because (as we have shewed before) there are found very few places which admit not of some Variation: yet because it may be profitable to such, who have not the Command alwayes of the Sunne, or sight of the Starres, I will insert this Theoreme.

The Line wherein the Directory needle is directed from North to South, is the Meridian for the place.

This may be shewed in any Marriners Compasse, or little Sunne-Dyall, whole needle is magnetically touched. For being fet enemly parallel to the plaine of the Horizon, it wil shew by the needle, the Miridian for that place in every vertical point on the earth. For example in the Sea-Compaffe in the next page. experience will witnesse in every Region of the Earth, that the one point figned out by the Lilly, will alwayes turne to the North; the other opposite part, will turne it selfe to the South; which two parts being joyned together by a right Line will shew the Meridian for that place: The Meridian (I fay) not alwayes the true; for this Invention taken from the Magnet is not so exact as the Astronomicall: for as much as few or no places are found, wherein the Magnetical Needle admits not a Variation from the true points of North and South: Neuerthelesse, this way is very necessary to be known: for as much as the Sunne and Starres are not alwayes to be feene; at least in such place and manner as may fauour exactnesse of observation; Hence may be demonstrated in particu-



lars, what we observe before in generall in our Magneticall Treatise that the Circles of the Globe are not meere Imaginary Filtions, or bare Resects, growing out of the Application of Calistial bodies (as some have thought them) but grounded on the Mognetical Disposition of the Terrestrial Globe.

Beside the Astronomicall and Magneticall Inuention of the Meridian, there is another way more popular, but lesse exact, which is without any observation of the Heavens, or the Magnets operation.

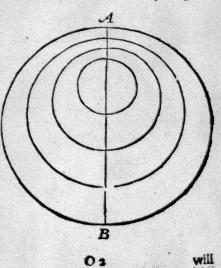
Of the Invention of the Miridian circle, the true and exact knowledge,

Knowledge (as we have shewed) is encepted to heavenly obfervation, or Magneticall experiment. Neverthelesse. Nature
is not so barren; but she hath pointed out to an industrious
observation, some markes and soote-steps in other inferiour
bodies, for the finding out of this profitable circle. Which
wayes, how sower of lesse Account then the other, and therfore
of lesse vie, are not with standing pleasant to vnderstand: because nothing delights more an ingenious minde, then the contemplation of Gods working, in and by his creatures, which
men vsually terme Nature. To make a particular search into
all Plants, Stones, Mettals, and other such Bodies, were to goe
too farre out of my way, without a Guide. I will give one enely Instance of Trees, where Will insert this Probleme.

By the Incision of a Tree, to finde out the Meridian.

To performe this Probleme, let there be chosen out some Tree in an open free field, farre from walles or other obstacles; in such a place as it hath beene on either side freely enlighted

and heated by the Sunne-beams : let the Trunk of this Tree bce very right and found: let this Trunke be cut off by the mid dest, in such fort that the fection be Parallell to the Horizon, and the vnder-part of the Trunke bee left to fland in his former Naturall fituation: Now the Section on the top of it being well plained,



will as in a plaine discouer divers circles, which are Excentricke and not drawne from the same Center, but on the one side necrer together; on the other further off: That part then which Thewes the circles thicker and neerer together, points out the North: The other wherein the circles are wider and further off, the one from the other, designes out the South-point : betwixt both which if a right line be drawne, it will be t'e Meridian for that place. Which experiment Blancanus (as hee writes) tryed in a Plume-Tree, but gives no reason for it. The cause I take to be no other then the extension and diffufion of the Sappe or mosflure, by the heate of the Sanne: which is more on the South-side then the North-side: for as much, as the Sunne in our clime refrects vs on the South, neuer on the North. Hence is it, that the circles which are nothing else but the excrescences of the moisture, being more rarefied on the South-side, and therefore requiring a greater place, are found to be greater.

Hauing thewed the Insention, we are in the next place to treat of the Distinction of these Meridian circles: A Meridian therefore is

termed either First or Common.

The distinction of Meridians into First and Common, hath no foot-steps in Nature, but is a meere arbitrary Imposition of antient Cosmographers. For no reason besides Conneniency can be shewen, why one Meridian should be called First rather then another: yet cannot this Distinction be wanting to a Geographer, for as much as some settled bound must be set, from which to begin our accompt of Longitudes.

The first Meridian is that from which we begin to number the Longitude of the Earth, from West to the East. In respect of which all the rest may be called common or lesse notable.

The ancient Cosmographers, amongst whom Ptolomy wa, the chiefe, haue fet the first Meridian in the Fortunate Ilands? from whence they began their accompt, passing Eastward through Europe and Africa, and fo through Afra, to the vitermost parts of India, vntill they returned agains to the first Meridian, paffing through the Fortunate Islands; Some hauc doubted whetherthele Hands called by Ptolomy the Fortunate Ilands, be the same with the Canaries; because (as our Countrey man M. Hnes hath observed) the Latitude given by Ptolo-my to the Fortunate Hands, agrees not exactly to the Canaries, but rather to the Ilands of Cape-Verde. Notwithstanding this observation, I rather sticke to the common opinion, thinking it no vnlike matter, that Ptolomy dwelling farre Eastward, and trusting to othermens observations, should erre in this, as well as other maters. The reason why the first Meridian should be placed here, rather then elfewhere, is thought by fome to be; because the Ancient's supposed two Magneticall Poles in the Earth, which should be the cause of the Variation of the Compasse. Now because in the Canary Hands, was found no Variation at all, they thought it to be the place where the Magnesicall and the true Meridian should concurre, as wherein were both the Poles, of the World, and of the Load Rone: which made them to make it the first Meridian : But this reason I take to be vnlikely; because as I finde it observed by latter Writers, in the Canary Ilands themselnes there is found a Variation of the Compasse, although very little: the reason whereof wee have shewed to be because it is the middest betwirt two great Continents, to wit, the one of Europe and Africa, the other of America. Whose magneticall temper being almost aqual! will not suffer the magneticall Needle to moue more one way then another? Morcouer, I am certainely perswaded (as farre as I can gather) that this placing of the First Meridian was appointed here before any certainty was knowne of the Variat on of the Compasse. The more probable coniccture therefore is that Ptolomy here placed the First Miridian, because it was the vttermost verge of land toward the West, then discouered, neuer dreaming of a Westerne world afterward detected

detested and brought to light by Christopher Calumbus and Americas Vefputius. Some of the latter Geographers friuing to be more exact, have placed the First Miridian in their Mappes out of the Canaries in the Ilands of the Azores called S. Michaels Hand. So that the first Meridian of Ptolomy differs from the place of these latter Cosmographers about o degrees: which is diligently to be noted of such as beginne the Science; because this variety not perceived, will breed great errour and confusion: yet is not the first of Ptolomy out of vie, but retained of many good Geographers. Enery other Meridian in respect of this, may be called Common, or leffe notable, because this is most remarkeable: yet may the rest compared amongst themselves be ranged in a certaine order, as the Second, Third, Fourth, Fift, and so along till we come againe to the Frift, being in all reduced to the number of 180, answering to 360 Degrees as we have taught. So much for the Meridians.

The Parallels are æquidiffant Circles passing from the East to the West di-

rectly.

I have defined the Parallell Circles in a larger sense then former Geographers viually have taken it in : as willing vnder this general name, not onely to include the Parallels commonly so called, but also the Equatour: because I see no reason why the Equatour being every where aquidiffant from each other Circle, should not suffer this acception. The common fort of Cosmographers, vnder this name, would onely comprize the minor Circles, which are conceived to be aqually distant and correspondent to the Equinottial Circle, so that all should be so called in respect of the Aquateur, to whom they are faid to answere, not in site and position; for as much as they decline from the middle of the Earth to the North and South : but in Comparison and Proportion; for as the Aguazour is drawne from East to West, and divides the whole Spheare of the Earth into the North and South Hemispheares: So the other also divide the Globe of the Earth, though not into two aqual parts as the Equatour, but vnequall. These Parallels

Parallels many wayes are diffinguished from the Meridians first because the Meridians are drawne directly from North to South: but the Parallels from East to West. Secondly. the Meridians, how many foeuer they are imagined to be, concurre and meete all in the Poles of the Earth : whereas the Parallels howfocuer drawne out at length, will neuer concurre or meete in any point. Whence it must needes follow that all Parallels and Meridians in the Globe must cut one the other, and make right angles. These Paralels although infinite in number, may be in the Spheare reduced to the number of the Meridians, because they are drawne through the opposite points and degrees of the Meridian Semi-circle, which would make up the number of 180: but yet for Conseniency they have not painted so many in the face of the Art ficial Spheare; for as much as so many lines and circles might beget Confusion. Wherefore Ptolomy and the Ancients have diffinguished the Parallels on both fides the Equator, North and South, with fuch a Diflance, that where the day should increase one quarter of an houre, a new Parallell should be placed. So that the longest day of one Paralell should surpasse the longest day of another, for one quarter of an houre. By which appeares that the Pa. rallels are not of one greatnesse, but by how much nearer the Pole they are placed, so much lesse are they; and so much greater by how much farther off from the Poles, and nearest the Aquatour. These Circles are of great vse in Geographie, as to distinguish the Zone, Climats, and Latitudes of Regions, to thew the Elevation of the Pole, and to defigne out the length and hortnesse of the day in any part of the Earth.

A Parallell Circle is of two forts; either greater or lesser: The greater is the AEqua-

tour or aquinoctiall Circle.

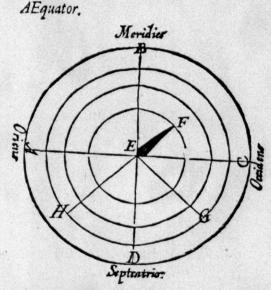
rallels, passing through the middest of the Earth, and exactly dividing them from the Poles

Poles into two equal halfs or Hemisphears whereof the one is North, the other South.

This Circle is called the Aquatour or Aquinothiall of Astronomers; because, that when the Sunne passeth under it, as voon the 11 of March, and the 13 of September, it makes the Day and Night aquall. This Circle of Astronomers is esteemed the most notable, being the measure of the Dimnall and most regular Motions. The Latines have taken the name and appellation of this Circle from the Day, as the Greekes from the Night: Wherein the Sense is no way varied; because the zquality of the Day argues the like zquality of the Night. The two Poles of the Circle, are the same with the Poles of the Vniverfall Earth: to wit the Articke or North-Pole, and the Antarticke and Southerne Pole: whereof the former is alwaves conspicuous in our Horizon, the other lies couched and hidde from our Sight. It is called the Articke- Pole from the Constellation of the little Beare in the Heavens, necre to the which it is fituated: in opposition to the which the other is called Antarticke. It hath manifold vie in Aftronomy, copioully described by Astronomers: And no lesse in Geographie: for without this Agninothiall Circle, no Description of the Earth can be absolute and perfect, neither any Citie or Place. in the Terrestriall Globe or Mappe set in his due and proper place. This Equinoctiall Circle in regard of the Earth, passeth through the middle-most part almost of Africa, by Athiopia, America, and Taprobana: So that it exactly divideth the Globe of the Earth into two halfes, the Northerne and Sontherne Hemispheares; so that these people which dwell vider the Equatour are faid to inhabite the middle of the world. because they incline neither to the North, nor to the South: having so much distance from the Article as from the Antarticke-Pole of the Earth. Moreover, by this Circle (as we will declare hereafter) are noted out vnto vs the East and West part of the Spheare, no way to be neglected of Geographers.

things are to be observed: either the Invention, or the Site and Position: The Invention is either Astronomicall or Magneticals. The Astronomical according to these Rules.

The Meridian being found out, to find the



This is easily performed by the helpe of the former Figure: for therein the Meridian line being found out (as wee have shewed) let there be drawne by the Center E of that Circle, the line A C, making right Angles with the said Meridian: which line A C will be the true Equatour, and will point out vnto vs the true East and West: as A the East and C the West. Whence it appeares that the two lines, to wit, of the Equa-

sour and the Meridian doe divide and cut the whole Horizon into two equal! Quadrants.

2. VVithout the belpe of the Meridian to finde out the AEquatour.

In the time of either Æquinoctiall in some Horizontall plaine, in the open Sun-shine. Let there be erected a Guomor then in the day time, let there be noted all the points by which the end or top of the shadow hath passed: for all those points in the time of Æquinoctiall, are in a right line; because then the end of the shadow is carried in a line in the time of the Æquinox in a Horizontall plaine: This line will be the true Æquinostiall-line: the cause is given by Clanius in Gnomonicis, lib. 1. prop. 1. Corolar 2. which depending on many Geometrical and Astronomicall principles, as too farre from my pur-

15 The Magneticall invention of the AEquatour, is wrought by the Magneticall Inclinatory Needle, according to this

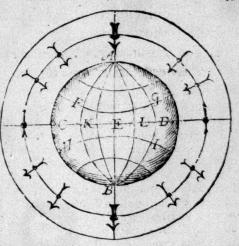
Proposition.

pole I omit.

Where soener at any place of the Terrestriall Spheare, the Inclinatory Needle shall conforme it selfe in a Parallell-wise, to the Axell of the Earth, through that place passets the AFquino Etiall Line.

As to finde out the Meridian of any place, we are to vie the helpe of the Directory Needle: fo to the finding out of the Equatour, and Parallels, the Inclinatory Needle is most needlary; because the former respects the Magneticall Motion of Direction, the latter of Declination: Now wherefocuer wee shall see the Needle to conforme it felf in such fort as it may lie Parallel with the Axell of the Earth, we may affare our selues that such a place is under the Equinoctiall Circle: The reason whereof

whereof, wee haue giuen in our 3 Chapter, out of the Connertible Nature of the Magnet, and here needes no repetition: only wee will infertthisone figure wherin the line C drawne through the Centers of two Inclina-



tory Needles, lying Parallel, to the Axell of the Earth, A.B. will expresse this Æqumoctial line which we heere seeke. For the Magnetical Inclinatory Needle being set in a Frame or Ring made for such a purpose, will vnder the Æquator respect one Pole no more then another: but seeleuell with the Plaine of the Horizon: as vnder the Poles it will make right Angles with the Plaine of the Horizon. In the moddle spaces betwist the Æquatour and the Poles, it will conforme it selfe in such fort, as it makes certaine Angles with the Axell of the Earth, though not æquall, yet proportionall to the Latitude; out of which an ingenious Artiscer may deduce the Parallels of any place, without any observations of the Heauens: as is taught by Instruments invented by Gilbert, Ridley, and divers others which have vndertaken this subject.

haue spoken: In the site we ought to confider fider the placing of the AEquatour in re-

spect of the world.

The Equatour is an vimoueable Circle, whose Poles never wary from the fixt Poles of the world.

Whether the Poles of the Equator have bin any times varied from the Poles of the world is a controversie which hath exercifed the greatest wits : Iofeph Scaliger trusting (as it seemes) more to ancient Hitlory then Moderne experiment, feemes in two Epiftles not only to make a doubt, whether the Poles of the Equatour have continued the same with the Poles of the world; but superciliously (as the manner of most criticks is) rather out of comecture then Reason, to taxe the common opinion of manifest errour and abfurdity. The ground and originall of this doubt- growes out of the observation of the fixt Starres, which have fince the Times of the Ancients, bin found to be moned out of their places, or at least not to retain the fame points in the Periode of the Sunner Motion. The chiefelt Instances are taken from the starres in the Hornes of Aries, which in Hyparchus time, which lived above to yeares before Prolomy, were observed to be not much distant from the . Equinoxe, and before him in the very point it felfe; but in our time removed about 28 Degrees off: Also it is observed in the Cynosure or Polar starre, that in Hyparchus time it was distant from the Pole about 12 Degrees, which we finde in our time to be scarce a Degrees distant. To falue this Apparence, Prolomy invented a flow motion of the Starry Heaven or Firmament, whereby the Fixt startes might bee removed farther off from the Equinoctial points in the Eclipticke, whence of a confequence the Pele-frare should not keep the same position in respect of the Pole it selfe, but vary his fite according to the Motion: which opinion hath a long time paffed without contradiction; till Copernicus out of new grounds fought for this Motionin the Earth , to which he affigned no leffe then three Motions. Since Copernicus, arose Infeph Scaliger, who con-

contradicting the common received grounds, and yet for ought Hee, not truffing to the suppositions of Copernicus, would bring in another op nion: to wit that the Starres of the Firmament are not moued from the point of the Aquinoxe, but rather that the point is carried away from the flarres. The decision of this point I dare not vndertake, better becomming the learned and industrious endeauours of our worthy Profesiours, M. Doctour Bambringe, and M. Henry Brigges, as best fuiting with their Learning and Protethor: Ipfe semipaganue, ad facra vacum carmen offero nostrum. Neuerthelesse as a Learner, for mine owne fatisfaction, I would willingly enter a little into conference with this great and admired Oracle lofeph Scaliger, to found the certainty of his grounds. That the Pole-frarre (faith he) was fo farre diffant from the Pole as 12 Degrees, was no true obternation, but the errour of Hyparchin, who afterwards by his authority deceined Ptolomy; and He, Posterity. The Reafons he alleaged are, I Because Endoxus which was more ancient then Hyparchus, observed the same starre to be in no other place, then where now it is. 2 Because that greater light of Astronomy, Copernieus perceiuing the Equinoxes and Solftitiall points to bee moved, was enforced to invent other grounds: but because his demonstrations depended only on the Apparences, he fought out this effect in the motion of the Earth. If it. were manners to oppole fo great a Scholler as Tofeph Scaliger, I would aske a few questions, why we should not credite the observations of Hyparchus, Ptolomy, and all posterity, as well as of Endoxus: fith Antiquity without consent and approbation, is no great argument of truth. Neuerthelesse if the matter bee well examined, we shall perhappes find Antiquity to be more firme on our fide. The fame reason (as I take it) may be given for the starres in the Hornes of Aries, as of the lole-farre, because all the fixt-sterres, by the consent of all, are imagined to keep the same uniforme fite among themselves in such fort, a the varying of some wou'd difor der all the rest : at least argue the like variety or change of all. Now to proue the startes of Aries to have bin varied, many of the Ancients (as Mafter Hues hath obterued) living in divers times, have confirmed.

The first starre of Aries , which in the time of Meto Attiens. was observed in the Vernall Intersection, in the time of Thales Milesim was before it 2 Degrees; in Tymocharis age it was after it 2 Degrees 24 Minutes: In Happarchus time 4 Degrees.40 Minutes; in Abbum szars 17 Degrees, 50 Minutes; in Albarens 18 Degrees, 10 Minutes; in Arzachels 19 Deg. 37 Min. in Alphon fin his time 23 Deg. 48 Min. In the time of Copernisw. and Rheticm, 27 Degrees, 21. Min. In our time about 28. Against al these Testimonies, if we should oppose the Testimony of Endoxm and Scaliger, we should be thought very partiall to preferre them before the confent of Antiquity : Endixus though very Antient, being but one, and the other one of the last. If any should object, that Endoxus spake onely of the Pole-ftarre, and not of the starres in the hornes of Aries; I anfwere, (as before, that the fame reason is to be given of them both; For as much, as if the Pole-farre in Endox m time moued in a Parallell, Equidiffant from the Pole of the Equatour (which he feems to contend) then must also the stars of Arres. which were found once to be in the point of the vernall Æquinoxe, moue alwayes in the Equinoctial circle, and neuer vary from it; which is contrary to allahe Testimonies before alleadged. Secondly, where he faith, that Copernicus perceiuing this error, left a bare discouery, without any Demonstration, except onely Ex Tor paroutres, I would know how lofent Scaliger by any other meanes came to know it? I alwayes fupposed it a principle amongst Mathematicians, that the ri ourswere had bin the furest ground of Mathematicall Demonstration : for every reason which can be alleadged, must of necessisty be grounded on meere conjecture, as forged in a mans braine without any observation of Nature; or elle suggested vnto vs from the things themsclues. How little dependency is on the Former, let enery man judge: where it is as easie for every man to deny, as affirme; and fuch fancies are better referred in the braine, wherein they were first hatched, then bee suffered to proceed further. If we derive our Argument (as we cught to doe) from the footesteppes of Nature; we must draw it either from the Forme it felfe, or from some effect or propriety a ising from it: The fermer is ynpossible I may well fay in any thing,

thing because thefirst forme & nature, no waies discovers it felf to our understanding, but by the apparent Accidents : much I fle can this be hoped for in the Heauens, being as farre diffant from vs in space, as Nature. If then we are left only to the later, what other ground can we have of our Argumentation, then the ra garrowna or Apparences: which kind of way, Scaliger in Copernicus frines to fleight or reject as weake or deficient: taking then this to be the only way to fearch as neare as we can into the truth of their matters, we will in the third place thew how farre it may oppose Scaliger, and fauour our Affertion. That the first starre of Aries is more distant from the Aquinoctiall point, is a matter which feemes to be agreed on by all fides. This Apparence must necessarily arise out of some Motion. This Motion must be sought either in the Earth (as Copernicus would have:) or it in the beauens. That it cannot with any great probability be in the Earth, we have shewed in the third Chapter, where we have proved it to have a Magnetical! verticity, whereby it continually respects the same Poles. The Arguments (I confesse) are only probable: but this is an opinion which scaliger defendeth not. If we feeke this effect in the Heavers, it must of necessity (which Sealiger confesseth) happen one of thefe 2 waves: For either the stars standing vnmoueable, the Æquinoctiall & Solftitiall points must be moued, or els the stars theselves should move, as Ptol. defends. Here I cannot but remember a merry infwer of that great Atlas of Arts, Sir Henry Samle in the like question. Being once invited vnto his Table, and having entred into fome familiar discourses concerning Afronomicall suppositions: I asked him what he thought of the Hypethelis of Copernicus, who held the Sunne to fland fixt, and the Earth to be subject to a Triple Motion: His answere was; he cared not which were true . To the Apparences were folued, and the accomp exact: fish each way either the old of Prolomy, or the new of Copernicus, would indifferently ferue an Aftronomer: Is it not all one (faith he) fitting at Dinner, whether my Table be brought to me, or I goe to my Table, fo I eat my meat? Such an answer would aswell befit this question: whether the first starre of Aries should be moued from the Eaminoitiall.

quinostiall point, or the posset from it, 'tis a matter should little trouble a Cosmographe: to either way might indifferently serve to salve the apparent observatios. But how Sealiger's pon this granted suppositio, would make all whole, without disturbing the order and forme of Nature in the celestiall Machine? what Regular motion he would gue the Sunne, whose period describes the Aquinostiall points, which he makes moveable what other Poles he would assign to the world besides that of the Aquinostial points. The full discussion of which points, as most of the rest. Illis relinquo quorum imagines lambuns -- Hedera sequaces.

17 The leffer Parallels are æquidistant lines answering to the Auguator, which divide the Globe of the Earth into two vnæquall

parts.

forts: either Named or Namelesse; Named are such as are called by speciall names, and have more speciall vse in Geographie; such as are the two Tropicks, and the two Polar circles.

Sunnes greatest declination, which is either to the North, and is called the Tropicke of Cancer: or towards the South, and is called the Tropicke of Capricorne.

The Tropickes have taken their names from the conversion or turning back of the Sunne; because the Sunne declining from the Aguinostiall circle either North or South, proceedeth in his course no surther then this circle, and so turneth backe: so

beleeue

that in the heavens they are as limits and bounds, comprehending within them that space, without the which the Sunneneuer moues : Confonant to thele Caleftell Tropic's, are there imagined in the earth the like, immediately placed under them: which are apparent, not onely by Application of the Caleffiall Globe, and his parts to the Terrestriall; but also out of the Magneticall disposition of the earth, as we have already shewed: The Tropicke bounding the Suns greatest declination towards the North, is called the Tropicke of Cancer, because the Sunne arriving at the Tropicke, is lodged in the figne of Cancer: The other is termed the Tropicke of Capricorne; because the Sunne touching that Tropicke, is in that figne: The distance of these Tropickes, from the Equatour, is ordinarily put 23. Degrees, and 30 Minutes; which is also the distance of the Poles of the Eclipticke, from the Poles of the world. The Tropicke of Cancer, as it is conceived in the Earth; paffeth by the greater Afia, by the Red-Sea, or Sinus Arabiem, and China. and India: But the Tropicke of Capricorne, Situate on the Southerne fide, runneth along by the most Southerne coast of Africke, and that part of America which is called Brafilia; Befides many Hands in the Indian Sea.

to the Polar circles are Parallels answering to the Polar circles of the Heauens, drawne by the Poles of the Eclipticke: These are of two sorts; either the Articke compassing round the North Pole; or the Antarticke compassing round the Antarticke or South Pole.

The Polar Circles, as they are conceived in the heavens by A-fronomersi, are described by the Poles of the Eclipticke, carried by the diurnall motion about the Poles of the world. Correspondent to these circles in the heavens are imagined two circles on the earth, which we also call Polar; and if wee

beleeve Gilbert, with other Magneticall Philosophers, they are primarily in the Earth, as that which is the true subject of diurnall motion. These circles thus described by the Pole of the Eclipticke, must needes challenge the same distance from the Pole, which the Pole of the Eclipticke hath, to wit, 23. Degrees, and 30 Minutes. The Greekes have taken the Polar circles, in another sense then the Latines: for by these Polar circles (as it appeares by Proclas, and Cleomedes) they vnderstand not such circles as are described by the Pole of the Zodracke : but two other circles : whereof the one is greateft of all the Parallels, which alwayes appeares aboue our Horizon; the other is the greatest of all those Parallels which lie hid in our Horizon perpetually: The reason why the Gracians tooke it in this fense, was; because by these circles they could know and diffinguish those starres, which alwayes are feene and neuer fet, as those which are comprehended of the Articke circle; from those which alwaies lie hidde and neuer rife; as fuch as the Amarticke containes: Whence it manifestly appeares, that the two Polar circles, as they are taken of the Gracians in all Regions, are not of the same quantity and greatnesse, but are greater in an oblique Spheare then in a right: but our Polar circles are at all places alike in their quantity. Of these, the one tearmed Articke in the Earth passeth by IA india, the top of Norway and Finland, with many adiovning Ilands, and the Southerne part of Groen-land, as may appeare by our ordinary Geographicall Mappes. The other Polar circle called Amarticke, pafferh through the South part of the world (as yet) undiscouered, except for some sewe parcels, as Terra del Fengo, and Psitacorum Regio, with some-what more, lately discouered by the Spaniards. The chiefest vie as well of these, as other Parallels, is to distinguish the Zones and Climates in the Globe, whereof we shall have occasion to treate hereafter.

The Namelesse Parallels are such as are not knowned by speciall Names, nor of so great vse in Geography.

Thefe

These namelesse Parallels may be well understood by that which we have about spoken : for how soeuer they be not called by particular and special names, yet are they all of the same nature: All these Parallels beside the Aquatour, though infinite in number, may notwith flanding in the speare be reduced to the number of the Meridians; because they are drawne through the opposite points of the Meridian semicitale; so that we might account 180: but yet there are not so many painted on the face of the Artifisial Globe; wherefore Prolomy with the ancients, leave distinguished the Parallels on both fides, North and South, beginning from the Æquatour at fuch fuch a distance, that where the day should increase one quarter of an houre, a new Parallell should be placed: so that the longest day of one Parallell, should exceed the longest day of another Parallell by one quarter of an houre. Euery one of these Parallels, is supposed to be divided into 360 Degrees, as all the rest of the other circles; yet are wee to note that the degrees and parts of a greater circle, are greater; of the leffer, leffe, according to the proportion of the faid circle; fo that the same proportion that a great circle hath to a leffe, the same have the degrees and parts of a quarter circle, to the degrees and parts of the leffer; as may be gathered from the first proposition of the second booke of Theodosius: now to know rightly this proportion, we must first finde out the fummary declination for every region, which being once found, we may proceed in this manner, by the doctrine of Triangles.

Let the fine of the Complement of the Declination of the lesser Circle be multiplied by the whole Circle, and the product be divided by the totall sine, there will arise the number of Degrees of the lesser Circle, such as whereof the

greater confifts.

The reason hereof is shewed in Geometry', and therefore need we not to insert a demonstration; for there we learne, that

as the totall fine is to the fine of the Complement of the Declination of any Parallell, so is the Periphery of the greater circle, to the Periphery of the Parallell: As for example, if wee would know what proportion the Equatour hath to the Parallell, which passet by the Verticall point of Rome; whose Declination is about 42 Degrees; I multiply the fine of the Complement of this Declination, that is, the fine of 48 I egrees; to wit, 74314, by 360; the product whereof is, 26753040; which I divide againe by 100000, and find 267 degrees, and : whence I gather that the Equatour to the Parallell of Rome, or a degree of the Equatour, to a degree of the Parallell of Rome, hath the same proportion that that 360 hath to 276; which is the same that 4 hath to 2.

Circles, such as are the Meridians and Parallels: we are to treate in the last place of a Relative Circle, which is conceived in respect to our sight: this Circle is called the

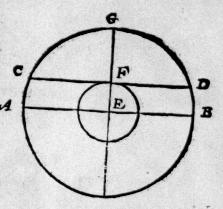
Horizon.

the vpper and visible parts of the Terreftriall Globe, from the lower and visible.

The name of the Horizon is taken from the bounding or termination of the fight; because it is a Circle comprehending all that space which is visible of vs, distinguishing it from the rest which lurkes invisible: as is a man should be placed in a high and eminent place of the Earth, and should looke round about himeuery way to the East, West, North, and South; Hee will seeme to see the heavens on every side to concurre with the earth: so that beyond it, can be seene nor heaven nor earth: which concurrence of the heavens with the earth, will describe rate vs the Horizontal Circle sor that place assigned. But

heere we are to note, that the Horizon is two-fold; either the Rationall or Senfible Horizon. The Rationall precifely divides the Globe into two aquall parts: But the fensible or apparent Horizon, is no other then that Circle in the earth, which is defigned out by the fight, from which the name feemes to be deriued. This tenfible Horizon differs from the rationall divers waves; first, because the rationall divides the whole spheare into two zquall parts; but the fenfible into two vnzquall parts. Secondly, because the rationall is alwayes certaine and the fame in the fame place, and of alike greatnesse; whereas the other is greater or leffer, for the condition of the place or fight; for the lemidiameter of the rationall, is the same with the femidiameter of the earth; but the semidiameter of the other, feldome or neuer exceedes 60 miles on the farth. Thirdly, because the rationall Horizon passeth by the Center of the Earth; whereas the fenfible toucheth onely the furface of it, in that point where the Inhabitant standeth: all which differen-

ces may be true in this Figure; wherein the Line C D represents vinto vs the fenfible Horizon: the Line A B the rationall: The for- A mer is called Naturallor Phylical; because it comes vnder the meafure & apprehéfron of the fenfe: the other Aftronomicall, because

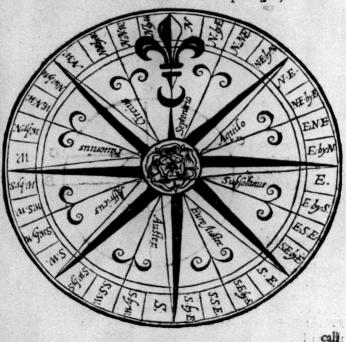


it is of great vie in Aftronomy: in the resolution of the Horizon is to his parts, we ought to consider two things: first, the Poles of the Horizon; Secondly. his Periphery, or circumference: The Poles are commonly called Zenith or Nadir: The

GEOGRAPHIE. The first Booke.

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Zenith is the Verticall point, directly placed ouer our Head; whereunto is opposite on the other side, the Nadir directly vider our foote, and therefore may be called the Pedall point. The parts or intersections in the circumferences, are designed out vinto vs, by certaine lines, discovering the coasts in the Terrestriall Globe: These lines are called either windes or Rhumbes: The windes with the Gracians were onely 8. But the latter Navigators have increased them to the number of 32, whereof source were called Cardinall; to wit, such as are directed to the source coastes of East, West, North, and South: The other are Collaterall, being placed on each side of the Cardinall windes. The Rhumbes are Lines passing by the Verti-



call point of any place, as you may fee in the Compaffe going before: Now because one Rhumbe answeares to two coasts or windes : the number of the Rhumbes is but halfe the number of the windes; to wit, 16. Here it is to be noted, that a Rhumbe differs from a Winde; whereas a Rhumbe is one line, pointing out vnto vs, two windes or coafts: Thefe Rhumbes as they are conceived in the Globe, were thought by Nonnus to be the portions of greater Circles: But learned M. Hnes in his booke, out of vadoubted principles, strongly confutes him. The groundes which he takes are these: First, that all Meridians of all places passe the Pole, and cut the Æquatour and all his Parallels at right Angles. Secondly, If our course should be directly any way else, then towards one of the Poles, a new Meridian must succeed, and a new Horizon. Thirdly, that the Iron Needle being touched with the Load-flone, shewes the common section of the Meridian and the Horizon, and on one fide perpetually respects the North. on the other the South. Fourthly, the same Rhumbe cuts all the Meridians at all places at aquall Angles, and every where respects the like coasts in the world. Fiftly, that a greater circle drawne by the Verticall points (if removed from the Æquatour) cannot cut divers Meridians at aquall Angles. Sixtly, a greater circle drawne by the Vertical point of any place, makes greater Angles with all other Meridians then with that from which it was first drawne: whence it is necessary, that the line which shall be supposed to make Angles with divers Meridians (as the Rhumbes) should be bowed toward the Meridian. I know not what would be more faid against the opinion of P. Nonnius, who would have all the Rhumbes to be portions of greater circles. To illustrate further the nature and vie of the Horizon we will infert these Theoremes.

2 The Sensible and Rationall Horizon in the Earth, are much different; in respect of the Firmament, all one. PtoLdiff.z. cap.s. dipb.6.diff.6.

It may be gathered out of the suppositions of Ptolomy and Alphraganus, and almost all other Astronomers, that no man being placed on the furface of the earth can precifely fee the halfe of it. For that Horizon which terminates our fight, as wee haue shewed, is a plaine superficies every way circularly extended in the Earth, in such fort as men placed, either in the Sea in a ship, or in a great field or Countrey, would think the visible part of the earth to be plain, whose ends wold feeme to touch the Heauens. Whence must needes come to paffe that fuch an Horizó canot divide the Spheare of the earth into two aquall parts. For fo much will be found wanting, as is measured betwixt that superficies which toucheth the earth, and that which paffeth by the Center of it , aquidiffant from the othersfor this later only can divide the earth into 2 aquall parts, according to Theodofius, and may well bee feene in the former figure, wherin are expressed both Horizons, as wel the visible as invisible, touching the Spheare in a point on the superficies: as the Rationall passing by the Center. Neuerthelesse we must consider, that the quantity intercepted betwixt these two Horizons in the Terrestriall Spheare, is of little or no moment, compared with the whole frame of the Heauens: For fith the Heavens are so farre distant from vs, it will come to passe that if two aquidistant lines should be drawne, the one from the Eye, the other from the Center of the Earth to the Firmament, they would according to sense, appeare one and the selte-same; by reason of the wonderfull distance : as wee fee in a long Gallery, whose walls have an equal distance the one from the other; the walls will notwithstanding (according to Optical principles) feeme widest where they are necrest, and to close and shut vp at the ends, or at kast to concurrenearer: much more must we imagine this to happen in the fight, if we compare the greatnesse of the Firmament with the Spheare of the Earth, in whose magnitudes wee shall finde an incomparable disparity. This will appeare by the Apparences : for we shall see the fixe fignes of the Zodiacke, confpicuous aboue our Horizon, and the other fixe voder it, hid from our fight: Also the Sunne and Moone, when they are drametrally

Prop.11.65.1.

trally opposed, almost at the same moment will appeare, the one in the East, the other in the West: at least the one will rise some vpon the setting of the other: And (if we believe Pliny) the Moone was observed to be eclipsed in the East point; the Sunne at the same time being in a fort about the Horizon in the West. Such an Eclipse could not happen without a diametrall opposition of the two lights, and therefore can the Sensible and the Rational Horizon have no sensible difference in respect of the Firmament.

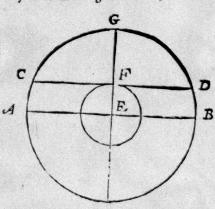
The fenfible Herizon may be greater or leffer according to the nature and disposition of the place.

In this confideration we take no notice of the difference of fights, whether they be weaker or fharper; but suppose an eye fufficient to kenne so farre in the Earth, as the place will permit. The difference then betwixt diverse Horizons must bee fought out in the condition of the place. A Sight placed on the top of a high mountaine, may fee much farther then one in a low valley, compaffed about with hills; for a finuch as the Semidiameter of the fensible Horizon, which is equall to the Rayes or Lines drawne from the extreame parts of the visible Earth, are much greater. The most indifferent judgement of this Horizon, may be taken from the Superficies of the Sea bevond fight of land: for a man thereon fayling in a ship, may perceaue the surface of the Sea as a plaine, on every side to bound the fight in a round circle, feeming together to terminate the end of the Earth, and protention of the fight. What the Semidiameter of this Horizon should be, hath not beene yet agreed vpon by all: Eraftothenes would have it to be 44 miles. Macrobins 23. Proclus 250. Albertus Magnus 125. These differences feeme too great to admit of reconcilement : yet taking into our confideration the diffarity in accourt of miles betwixt the Moderne and Ancient Cosmographers; as also betwixt the Greekes and Latines: 2 the diverse placing of the fight. 3 the various disposition of the places wherein they tooke their obfernations, with other circumstances, we should diminish much

of admiration. But diverse others whose opinion is more approved by moderne Cosinographers, have defined it to be about 63 miles. The cause why this Horizon should be so little in respect of the Rationall which passes by the Center, is the roundnesse of the earth interpreted betwitt the sight & the farther parts, which we have formerly proved.

3 The eye may be so placed on the Earth, as it may hehold the whole Hemispheare of the heavens, and yet no part of the Terrestrials spheare.

This may feeme a paradoxe with vulgar in Igements; but it wants not a demonstration drawne from Astronomicallan. I Optick principles. To explaine which, we must suppose out of the grounds already granted, I That the fensible and Rationals Horizon in respect of the Heauens, ought to bee esteemed one and the selfe same, by reason of the great distance and disproportion betwixt the Earth and the Firmament. 2 That the eye of the beholder is in this fort supposed to be in the Center; because in this consideration the distance betwixt the superficies of the Earth, and her Center, is insensible. 3 That the visuall Ray wherein the sight is carried, is alwaiss a right line. Now



Suppose (according to our former figure) the Center of the eye wherein confifts the fight, to be in the point of the Terrestriall furface F, the di-Stance (as wee faid) betwixt F and E the Center being insensible, the eye is imagined in the center: likewife the Ho-

rizon

rizons CFD, and A E B for the same cause in respect of the Heaves are to be effected one & the fame because CA & DB have no sensible difference. It is the manifest, that the eie so placed will behold in the heavenly Spheare, all which is included betwixt A & B, to wit the Hemispheare A G B, bounded by the Rationall Horizon AEB. Neuertheleffe in the Terrene Globe it can fee nothing at all: For either it should fee only the point F, wherein it is feated, or else some other point or part diitant from it: the former cannot be admitted, because the eye being there supposed to be placed, should according to this supposition behold it selfe, which is against Philosophy: For granting the fense only a direct and not a reflexe operation, it cannot be imagined how it should percease it selfe. Finally, it cannot fee any point in the Earth befides; for then this point would either be placed about the point F: but this cannot be; because F being supposed in the superficies, admits of no point higher in the Spheare, or else vnder it : but this cannot bee, because CFD being a rangent line, and touching the Spleare in Fonly: there cannot according to Geometricall principles bee drawne any right line from the point F, which can touch any point in the faid Spheare, but all will cut it, and so the section cause impediment to the fight, the Earth being an opacous and round body.

From the Horizontall circle is reckoned the elevation of the Pole in any place assigned.

The finding out of the elevation of the Pole is a matter most necessary for a Cosmographer; as shall appeare after, where we shall speake of the Latitudes and Climates. It is defined to be an arch of the Meridian betwixt the Horizon and the Pole. For the finding out of which many waies have beene deuised by Artificers: The first is taken from the Sunne, the second from the Pole-starre: From the Sun it may be performed two waies. I At the time of the Aquinexe. 2 At any other time of the yeare. At the time of the Equinox it may be found out by the observation of the Sunnes shadowe at Noone-tide, in this manner: Let the Meridian height of the Sunne be fubtracted

R 2

tracted from the whole quadrant, which is 90 degrees: theer will remaine the distance of the Zenith to the Æquator, which is æquall to the elevation of the Pole. In the fecond place at any time of the yeare to knowe the cleuation of the Pole out of the Meridian height of the Sunne, it is necessary out of an Ephimerides, or any other way, accurately to finde out the place of the Sunne in his Eclipticke for the day proposed, together with his declination: for the declination of the Sunne, the Sunne being in the fix Northerne fignes, subtracted from the Meridian altitude; or added, the Sunne being in the fix Southerne fignes, will precifely give the height of the Louator: or (which is the fame) the Meridian heigth of the Sun in the Equinoltiall: which being once found, we may worke as in the former. By the Polestarre we may like wife finde it out, if wee obserue it three distinct times in the same night: for three points being given, every Geometrician will finde out the Center, which in this case must be the Pole. Many other waies have beene invented by skilfull Astronomers, which appertaining rather to Astronomy then Cosmography. I purposely omit.

24 Concerning the Horizon, two things are chiefly to be noted, the Invention and the Distinction. The Invention is considered either as it concernes the Zenith or Pole: or the Plaine of the Horizon. For both which

we will fet downe these Rules.

The height of the Pole subtracted from the quadrant of 90 Degrees: the residue will show the Zenith or distance of the Zenith from the Pole.

The reason is evident; because the height of the Pole, together with the distance of the Pole and the Zenith make an arch, which is a whole quadrant; so that the height of the Pole subducted, the distance will remaine; as for example, if we put the elevation elevation of the Pole here in Oxford, to be 51 ½ degrees or thereabout (as hath beene formerly taught: Let these 51 ½ degrees be subtracted from 90, then will remain 38½, which is the true Zenith for that place.

2 A line which makes right angles with a plummet perpendicularly falling on it, will designe

the Horizontall plame.

The practife of the proposition is vsually shewed by Artificers by a certaine instrument called a Levell, which is made in a triangle forme; from the vertex, or head of which, a line with a plummet falls on the Basis. Now when it shall be found to be so placed, that the line and plummet falling on the Basis, shall make right Angles with it, and cut the whole Triangle into two æquall halfes: we may account the Base-line to be the plaine of the Horizon: For of this plaine, such is the position, that it inclines no more on the one side then on the other, but lies even: as we see in the surface of the water, when it rests quiet without motion: for how soever the water so resting (as we have formerly demonstrated) is alwaies sphæricall, yet in a small distance in the sensible Horizon, it may to sense be represented by a plaine.

25 So much for the Invention: The Distinction of the Horizon is into three sorts for either it is a right Horizon, or oblique, or

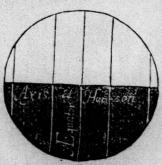
parallell.

A right Horizon is that which with the

AEquator makes Right Angles.

This distinction growes naturally out of the Respect of the Horizon to the Aquator. For sith the Aquator is one and the selfe-same immourable circle; and the Horizon is mutable and changed according to his diverse verticall points, they cannot alwaies keepethe same situation in regard one of the other. This they have reduced into three heads: for either it is Right.

or Oblique, or Parallell. The Right is so called from the right Angles which the Horizon makes with the Equator: wherein the two Poles are alwaies couched in the Horizon, and the A-



quator passing directly over their heads, as is plaine to bee seene in this figure here assixed: such a Horizon have these Inhabitants which dwell directly under the Æquinoctial line, in the very middels of the Torrid Zone: such a Horizon agrees to a great part of Africke: to a part of Peruin America: Also to most of the Molucco Ilands, the

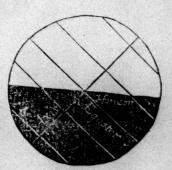
Ilands of Taprobana, and S. Thomas: but no part of Europe is fubicet to fuch a Right Horizon. The cause of this variation of Horizons is the naturall roundnesse of the Earth: For the earth being supposed to be sphæricall, as we have before demonstrated, it must of necessity follow, that the fite of the Poles should be changed according to the diversity of the places. Also, because wheresoeuer wee are placed on the Earth (as wee haue shewed) all impediments of the fight, as mountaines and vallies put apart, we can behold the Hemispheare of the Heauens, which middle part being fet downe is divided from the part vnseene, by the Horizou it must needs be, that either both the Poles must be in the Horizon and so make a Right Spheare: or at least one must be about and seen, and the other hid from the fight, and so much as one is elevated above the Horizon, must the other be couched under it. For otherwise wee should see more or leffe then a præcise moity, or halfe of the Heauens: fith the Poles differ one from the other the halfe of the whole Heavens: to wit, by the Diameter of the world.

27 An oblique Horizon is that which with the Equator makes oblique Angles.

Those Inhabitants are said to have an oblique Horizon, whose

fite an position declines somewhat from the Aquator, either to the North or South towards either Pole: yet so that the Pole be not elenated so high as 90 Degrees: for then it becomes a Parall. Il Horizon, as we shall shew in the next. The representation of such an oblique Spheare may bee seene in this Diagrams wherein the Horizon cuts the Aquatour at oblique An-

gles, whence it is called oblique. Clavins feemes to adde another reason of this appellation: to wit, because in such an Horizon one Pole is alwaies eleuated aboue, & the other hid: but this reafon seemes too generall, as that which agrees not only to an Ohlique, but also to a Parallell Spheare. From this Horizon, by Iohannes de Sacrobosco, the Spheare is cal-



led Artificialli because, as Clavius consectures, it is variable, & doth not naturally divide the Globe. For whereas the Horizon of the Right Spheare passeth by either Pole, it seemes by it selfe (as it were) Naturally and Directly to divide the Spheare: and this division is no way variable, as that it should bee more or lesse Right: but contrariwise in the oblique Spheare, sith one Pole is placed aboue, and the other beneath, it seems to be placed out of his naturall site and position: Moreover this Oblique Horizon is variable according to the diversity of habitations, so that it may be to some more, to others lesse Oblique: for so, with the more Oblique must it bee, by how much the nearest is placed to the Poles. The Inhabitants of an Oblique Spheare, are such as are seated betwixt the sequator, and either of the Tropicks of Cancer and Capricorne, or such as dwell betwix either Tropick and the Polar circle.

28 A Parallell Horizon is that which lies Parallell to the Equator, making no angles at all with it. Such Such a kinde of Horizon those Inhabitants are said to have, which are included betwirt the Poles of the world, and the Polar circles; whose Horizon cuts not the Equatour at any Angles at all, either Right or Oblique; but lies Parallell ynto it, as



we see in this Figure here set downe. Some have reduced this kinde of Spheare to an Oblique Horizon; in regard that in this site our Pole is elevated above the Horizon, and the other depressed vnder: in which opinion Clanical seemes to second Iohannes de Sacrobisco, on whom he comments. But this is ridiculous; because the Sphear

is called Right or Oblique (as we have taught) from the Angles which the Horizon makes with the Equator: wherefore that Horizon which makes no Angles at all, cannot be called either Right or Oblique, but is necessarily distinguished from either. On this distinction of Horizons is grouded the division of the Inhabitants of the Earth according to three kinds of Spheares: of whose accidents and proprieties wee shall more fully treat hereafter in the distinction of the parts and Inhabitants of the Terrestriall Spheare because such proprieties cannot so well be taught without the knowledge of the Artissiall Spheare, whose Nature and Fabricke we shall labour (God willing) in our next Chapter to vnfold.

Of the Artificiall Representation of the Terrestrials Spheare.

Hauing hitherto treated of the Terre.

ftriall Spheare, as it is Naturall or reall

all: we are in the next place to speake of the Artificial: Globe: The Artificial! Globe is an expression or imitation of the Spheare of the Earth.

ther Common or Magneticall. The common is againe twofold; either in the Globe, or in the Geographicall Mappe, or Table.

3 The Geographicall Globe is a round folid Bodie, adorned with Lineaments and pictures, feruing for the vse of Geographers.

Who was the first Inventour of this Artificiall Globe, it is not euident: some thinke with Pliny, that it was found out by Atlas, and carried into Greece by Hercules. Others have ascribed it to Anaximander Milesims; forne to Musaus, as Directus Lacrius: others to other Authors, amongst whom Architas Tarentims is not forgotten, as one that was esteemed the rarest Mathemetician of his time. But all thesewere out-stripped by Archimedes the Syracusan Mathematician, who is said to have composed a Spheare of transparent glasse, representing vnto the life the whole frame of the Heavens, wherein the Sun, Moone, and Starres with their time motions, periods, and limits were shewed to the sight, in such fore, as if it were naturall: whereof Claudian the Poet elegantly wrote in these Verses.

Claudian. in Epigrammat.
Inpiter in parvo cum cerneret athera vitro,
Risit, & ad Superos talia dicta dedit:
Huccine mortalis progressa potentia cura?
Iam meus infragili Inditur orbe labor.
Iura poli, rerûmg, fidem, legés fg, Deorum,
Ecce Syracusius transtulit arte Senex.
Inclusus varys famulatur spiritus astris,

Et vivum certis motibus urget opus.
Percurrit proprium mentitus signifer annum,
Et simulata novo Cynthia menseredit.
Iamáz suum volvens audax industria mindum,
Gaudet & humana sidera mente regi.
Quid falso insontem tonitru Salmonea miror?
Æmula natura parva reperta manus.

In a small glasse when Ione beheld the Skies,
He smil'd, and thus vnto the gods replies:
Could man so farre extend his studious care,
To mocke my labours in a brittle Spheare?
Heavens lawes, mans waies, and Natures soueraigne right,
This Sage of Syraeuse translates to sight.
A soule within on various starres attends,
And moues the quicke-worke vnto certaine ends.
A faigning Zodiacke runnes his proper yeare,
And a falle Cynthia makes new monthes appeare:
And now bold Art takes on her to command,
And rule the Heavenly Starres with humane hand.
Who can admire Salmonean harmlesse Thunder,
When a slight hand stirres Nature vp to wonder?

But this Spheare of Archimedes I take to be more then an ordinary Globe commonly vsed amongst vs, as may appeare by the Poets description; so that it may rather be likened to the Spheare, lately composed by Cernelius Trebelius, and prefented vnto King Iames. The like whereof Peter Ramus sayes he saw two at Paris; yet not of glasse, but of Iron; the one of which Ruellius the Physician brought from the spoiles of Sicily: the other of which Oronzius the Mathematician recoursed likewise from the Germane warres. But of such kind of Globes having never yet had the happines to see any, I intend no description: In the meene time our common Geographicall

Globes may well ferue our turnes.

4 In the Terrestrial Globe two things are to be considered: 1 The Fabrick or Structure.

points

2 The Vse. 3 The Direction. In the former is taught the composition of the globe by resoluting of it into it's parts.

The parts whereof the Globe is Geographically compounded are circles and pictures.

To explaine the true composition of the Artificiall Globe, not Physically as it consists of timber and mettall, but Geographically as it represents the Earth, we are to consider, that the parts of it are either Externall or Internall : Externall I call those parts which are without the Spheare it felfe, yet necessarily concurre to the constitution of it. These parts are such as concurre to the making of the Stock or Frame whereunto our Spheare is fet: whereto let paffe the footing or lower board, (wherein in the old Globes was engraffed a Marriners Compaffe, with a Needle magnetically touched, very profitable for the direction of the Spheare) I will onely speake of the great Timber Circle, encompassing round the whole Globe: because it more immediatly concernes our purpose. This Circle reprefents the Horizon of the Naturall Spheare: In the Globe it is made but one not that there is but one Horizon in the whole Earth; because (as we have taught) the Horizon is varyed according to the places; but because it is impossible to point and marke out the Horizons; for all places being infinite as the Verticall points: yet may this one serue for all places, because the Globe being moueable, may apply all his parts to this circle. This Circle representing the Horizon, is divided into three borders or Limbes: whereof the first which is towardes the Spheare, containes all the fignes with the Planets thereu ito belonging; every of which is divided into 30 Degrees, which in the Timber Circle are described by set numbers and markes. The second which in the middle-most and longest, containes the Calendar, with the Golden number, and seuerall names of all the Feasts throughout the yeare. The third and last is of the 32 Windes, feruing chiefly for the vse of Marriners, and may ferue many waies for a Geographer to diffinguish the Coasts and

points of the Earth. But of these three borders diftinguished in the Horizon, only the last hath vie in Geography; the other two are in themselves Astronomicall, and placed in the Geographicall Globe rather for ornament, then vie. The Internal parts of the Globe are either annexed or inscribed in the face of the Spheare. The Annexed part is that which represents the Meridian, which is a Brasen circle: For as the Externall Frame of the Globe contained the Horizon as one circle: fo this Meridian is fet but one, although it be in it felfe various, according to the places to which it serue. Neither without good reason is this Circle made of braffe, because it should serue for diverse vies, which require that it should be often changed and turned to and fro, which being of Timber would miscarry. This Brafen Meridian meetes with the Horizon at two opposite places, cutting it at right angles, that the Spheare included might be raised and set lower, as occasion requireth. The Meridian circle is againe divided into 4 Quadrants, each of which is again diuided into 90 Degrees; fo that on the one fide the 90th Degree must touch the Pole; on the other side the first degree; so that in all there will arise 360 degrees, described in the Brasen Meridian. Through this Brasen Meridian by the two Poles doth passe a line or wier, which is called the Axell-tree of the Globe, about the which the Spheare is turned, the ends of which are commonly called the Poles; whereof the one representing the North point is called the Pole Articke; the other shewing the South, is termed Antarticke. To this Meridian Circle in the Globe is commonly fathned a little Brasen Circle, named Cyclus herarius, or the houre-circle; but this rather appertaines to Afronomy then Geography, and therefore we will forbeare to de scribe it: somewhat more vse have we of another Instrument failned to the Meridian, called the Quadrant of Latitude; forasmuch as it may serue to measure the Distance betwixt any two places figned in the Globe: but in fo groffe an Instrument litle exactnesse can be expected. Now for such matters as are inscribed in the Spheare it selfe, (to let passe ridiculous & idle pictures vsed of Painters for ernament) they are either Lines & Circles drawne on the face of the Globe: or elfe the pictures & deli-

delineations of Countries and places, marked out in visible proportions; whereof the former properly appertaines to the Sphericall part of Geography; the latter to the Topicall. Circular Lineaments are againe twofold; either Circles necesfarily appertaining to the conflitution of the Globe; or elfe Lines thereon drawne to be confidered of Marriners, which we have before called the Rumbes. But thefe Lines also (as we haue taught) appertaine to the Geographer, being as fo many fections of the Horizontall Circle; because they are alwayes imagined to proceed from a Verticall point wherein they meet. The Circles painted on the Globe are either the Parallells or Meridians, whose description we have fee downe in the chapter before: Amongst the Parallels the most remarkeable is the Aguatour, which is made greater then all the reft, in forme of a bracelet, distinguished into degrees, and marked at every 10. degrees: Next to this are the Tropicks and Polar Circles, represented only by blacke Lines, yet framed in such fort, that they may eafily be difcerned from other Parallels. Amogst the Meridians the most notable is the first Meridian passing by the Canaries, and painted much like the Equatour, cut into divers fections and degrees, in fuch fort as we have described. For the Zodiack which is vfually pictured in the Terrestriall Globe, I hold it altogether needlesse in Geography, and made rather for ornament, then vie; forasmuch as the Periodick course of the Sun, deciphered by the Ecliptick, apperatains rather to the Theory of the Planets, which is the hardest part of Afronomy. The proportion of these Circles, Site, and Distance is taught before, and needs no repetition, fith it is the very fame in representation on the face of the Globe, which it is really in the Earth it selfe. For the Pictures and Topicall description of the Earth, we referre it to the second & third part of this Treatile; where we shall have occasion to speake of Countries and Regions, with their feuerall qualities, accidents, and dispositions.

2 The Use of the Artificiall Globe is to expresse the parts of the Earth so farre foorth as they

haue

have a dwerfe situation as well one in respect of another, as of the Heavens.

The vse of the Artificiall Globe is two-fold, either generall or speciall: the Generallis expressed in this Theoreme: the Speciall shall be shewne in diverse speciall propositions hereaster as occasion shall ferue:

5 The Direction is taught in the Rule.

The Meridiao for the place being found by the Sunne or Compasse: 1 Let the Globe bee so set, that the North Pole respect the North, the opposite the South. 2 Let the Pole in the Meridian of the Globe be set according to the elevation of the Pole at the place assigned.

6 A Geographicall Mappe is a plaine Table, wherein the Lineaments of the Terrestriall Spheare are expressed and described in due

fite and proportion.

Some would have the name of a Mappe to be drawne from the linear furniture wherewith it is endorfed, which is not vn-hkely, in regard of the affinity of the words in Latine. But more fignificantly by others it is termed a Geographicall Table or Chart: A Mappe differs from a Globe, in that the Globe is a round folide body, more neerely reprefenting the true figure of the Earth, whereas contrary wife the Charts of themfelues are plaine, though reprefenting a Spheare, invented to supply the want of a Globe. For whereas a Globe is more costly to be procured of poore Students, and more troublesome to be carried to and fro; a Mappe is more cheape to be bought, & farre more portable: And how soever it be not so apt an expression as the Globe, yet are there sew matters represented in the other, which may not in some fort find place in this. And certainely

tainly fuch is the vicand necessity of these Tables, that I hardly deeme him worth the name of a Scholler, which defires not his Chamber furnished with such ornaments. It is written of that fearned man Erasmus Roterodamus, that having seene 50 yeares. he was delighed fo much with these Geographicall Mappes, that undertaking to write Comments on the Attrof the Apostles, he had alwayes in his eye those Tables, where he made no small vie for the finding out of the site of such places whereof he had occasion to treate. And it were to be wished in these dayes, that yong Students infleed of many apish and ridiculous pictures, tending many times rather to ribaldry, then any learning, would flore their fludies with fuch furniture. These Geographicall Mappes are of two forts, either Vniuerfall or Particular: The Vniuerfall are such as represent the picture of the whole Earth. The particular are fuch as thew only forme particular Place or Region. These particular Tables are again of two forts; some are such as describe a place in respect of the Heamens, whereon are drawne the Geographicall lineaments by vs described, at least the chiefest: some again are such as have no respect at all to the Hesuens; such as are the Topographicall Mappes of Cities and Shires, wherein none of the Circles are described. For the Vniuerfall & first fort of particular Mappes, there is no question but they properly appertaine to Geography: But the later deferue much leffe confideration, as being too speciall for this general! Treatife.

7 The Geographicall Mappe is twofold: either the Plaine Chart, or the Plain/pheare: The Plaine Chart we call that which consistes of one face and Right lines.

Such a Chart we find commonly set soorth under the name of the Marriners Sea-(hart: for how source it seems to have chiefest vie in Nauigation, yet is the Nature & vie of it more generall: as that which not onely expressent the Sea, but the whole Terrestrial Globe: Forasimuch as the Parallels, Meridians.

dians, and Rhumbes, whereof primarily it confifts, are circles common to the whole, and not appropriated to either part.

In the Plaine-Chart we are to confider. Two things. First the Ground, Secondly the inscription. The Ground is the space or Plat-forme wherein the Lines are to be inscribed: the Inscription teacheth the manner how to project the Lines.

In the Chart two things are remarkeable; to wit, the plaine whereinto the Lines are inscribed: Secondly the Lines or Inscription it selfe: so we are here to handle two points: First how this *Plaine*. Chart should be conceived to bee produced out of the Globe; whereof it is a representation. Secondly what rule or methode we ought to vie for the inscription of the Meridians, Parallels, Rumbes, and other Lineaments therewite annexed. Both which depend on these Propositions.

The Geographical Chart is a Parallellogramme conceined to be made out of a Spheare, inscribed in a Cylinder, enery part thereof swelling in Longitude and Latitude, till it apply it selfe to the hollow superficies of the said Cylinder.

This Theoreme seeming at the first obscure, consists of many parts, which being once opened, will soone take light. First then to know the Ground-work of this Parallellogramme thus defined, we must suppose a Sphæricall superficies, Geographicall or Hydrographicall, with Meridians and Parallels to be inscribed into a concaue Cylinder, their Axes agreeing in one. Secondly we must imagine the superficies thus inscribed, to swell like a bladder, blowing æqually in euery part, as well in Longitude, as Latitude, till it apply it selfe round about, and all along towards either Pole, vinto the concave superficies of the Cylinder; so that each Parallell on this superficies, successively

growes greater from the Equinoctiall towards either Pole, vntill it challenge a quall Diameter with the Cylinder; and likewife all the Meridians growing wider and farther off, till they be as farre distant every -where as is the Æquinoctiall one fro the other. Hence may eafily be understood the true Mathematicall production or generation of this part: for first of a Spinericall superficies it is made a Cylinder : and secondly of a Cylinder it is made a Parallellogramme, or plaine superficies: For the concaue superficies of aCylinder is nothing elie but a plain Parallellogramme, imagined to be wound about two rquall aquidiftant circles, hauing one common Axel-tree perpendicular vpon the Centers of them both; and the Peripheries of them both, aquall to the length of the Parallellogramme, as the distance betwixt those Centers is aquall to the bredth thereof; In this Chart so conceived to be made, all Places must needes be fituate in the same Longitudes and Latitudes. Meridians. Parallels, and Rumbes, which they had in the Globe it felle; because we have imagined every point betwixt the Aquatour & the Poles, to swell a qually in Longitude and Latitude, till it apply it selfe to the concautty of the Cylinder: fo that no Pole can be displaced from his proper seat, but only dilated in certaine proportion. And this I take to be the best conceit for the ground-worke or platforme of this Geographicall Chart.

2 Except the distances between the Parallels in a Plaine-Chart be varied, it cannot bee excused from sensible errour.

It hath bin thought by many Geographers, that the Earth cannot aptly according to due symmetry and proportion be expressed in a plain superficies, as it is in the Globe: for as that which is iouned and vnited in the Globe, being of a Sphæricall figure, is in the Mappe extended and dilated to a diverse longitude and latitude from that Sphæricall delineation: and although it hath bin generally conceited by many writers, that no due proportion could be observed in a Sphæricall superficies, without sensible errour: yet most exception hath bin made against this Chart here mentioned, consisting of one face

and streyte lines, which in substance (if we consider the Circles) differs not from the Nauticall Chart: of whole errours Mar. tin Cortele, Peter Nonnus, and many others have complained: which escapes are excellently opened and reformed by our Countryman Edward Wright in his Correction of Nauticall Errours. The reason or ground which drew these men to think that the Earth could not bee proportionably described in a plaine superficies, proceeded from the common proportion of the Lines and Circles on the Chart. For supposing the Parallels cutting the Meridians at aquall Angles, to observe an aquall distance enery-where one from the other; these errours and abfurdities mult of necessity ensue. First, what places soeuer are delineate in the ordinary Chart, the length of them from East to West hath a greater proportion to the bredth from North to South then it ought to have, except onely vnder the Æquinoctiall: and this errour is so much the more augmented, by how much those places are distant from the Æquinochiall: for the nearer you approach the Pole, the proportion of the Meridian to the Parallell still increaseth; so that at the Parallell of 60 degrees of latitude, the proportion of the length to the bredth is twice greater then it ought to be; forafmuch as the Meridian is double to that Parallell, and so in all the rest: whence as Edward Wright obserues, the proportion of the length of Friefland to the bredth thereof, is two-fold greater then in the Globe which expresseth the true proportion; because the Meridian is double to the Parallell of that Iland. In like fort it is plaine, that in the Ilands of Grock-land and Greenland, the length to the bredth hath a foure-fold greater proportion in the common Chart, then in the Globe; because the Meridian is foure-fold greater then the Parallell of those places. Wherefore it cannot be conceited, that the manner of finding out the difference of Longitude by the common Chart, can be any-where true without sensible errour, except onely under the Equinoctiall, or neare about it; because in no other place the Parallell is aquall to the Meridian. In other places the errour will be sensible, according to the difference of the Meridian, and Parallell of that place: whereas if the contrary

were granted, it would follow, that two ships sayling from North to South, under two feuerall Meridians, would keepe the same distance the one from the other of longitude neure he Pole, which they had neare the Aquator; which is unt offibie: because Meridians cannot be Parallell the one to the other, but by how much they approach the Pole, by fo much t' ry are nearer, that in the end they all concurre and meet in the, Pole it selfe. Secondly this common Chart admitted, there would arife great errours not only in the fituation of divers places, which appeare to be vnder the fame Meridian, but also in the bearing of places one to the other. The reason is manifest, for that the Meridian is a certaine Rule of the fite and position of places; therefore when foeuer any errour shall be committed in the Site and Polition of the Meridian, there must needs follow errours in the designation of the Rumbes, and other points of the Compasse. And therefore every respective position of place to place, fet downe in the common Chart, cannot be warranted. A pregnant example we have in the way from India; for the Promontory of Africke, called the Promontory of three Points, having of Northerne latitude 4 Degrees and a halfe, & the Hand of Tristan, Acugua, having 36 degrees of Southerne latitude, are in the common Chart fet under the fame Meridian: But the Chart sheweth the distance betweene these Ilands, and the Cape of good Hope to come neare to 400 leagues; both which cannot stand together; for if all the coast from the Promontory of Three Points. vnto the Cape of Good-hope be rightly measured, and the Promontory of Three Points lye also vnder the fame Meridian with those Ilands, yet must the distance be much leffe: But if it be not leffe, it cannot fland with reason that it should have the same Meridian with the Promontory of Three Points, but must needes lye more Westward, Thirdly, there must needs arise a greater errour in the translating Seacoasts and other such Places out of the common Chart, into the Globe; because they have only a respect to the Numbers of Degrees of Longitudes and Latitudes found therein; so that not only errours appeare in the Sea-Chart, but also otherwhere thence derived. These and many more errours have bin detedetected in the comon Sea-chart, which (as we have faid) respecting the circles, ought to be imagined one & the selfsame with the projection of the lines in a Geographical table; which oversight Ger. Mercator in his vniversall Map seems to corrective leaves no demonstration behind him to teach others the certain way to draw the Lines, as Meridians, Parallels, & Rumbs on the Chart, in such fort, as these errours might be prevented, and the due proportion and symmetry of Places well observed. But our industrious Countryman both waded through all these difficulties, and found out the true demonstration of a projection of these Lines to be inscribed in the Chart in such forte, as no sensible errour can show it selfe, from whose copious industry we will extract so much as may serve our purpose, only contracting his invention into a shorter methode, having many matrers to passe through in this Treatise.

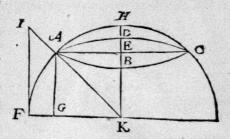
The Distances of the Parallels in the Chart must encrease proportionably as the Secantes

of the latitude.

It hath bin a conceived errour (as we have shewed) that all the Parallels in the Chart here mentioned, should every-where keep the same Distances one from the other, from the Æquator to the Poles; yet because no man (for ought I know) hathout of Geometricall grounds discouered the true proportion, befide my fore-named Author; I must heerein also follow his direction as neare as I can in his owne footsteps; because I would not any way prejudice his Invention. First therefore we must consider in that Chart, because the Parallels are aquall one to the other, (for every one is fet aquall to the Aquinoctiall) the Meridians also must be Parallell and straight Lines, & by confequence the Rumbes, making æquall angles with every Meridian, must be also straight lines. Secondly, because the sphericall superficies whereof the Chart is imagined to be produced, is conceived to swell and enlarge it selfe every-where aqually, that is, aswell in Longitude as Latitude, till it accommodate it felfe to the hollownesse of the Cylinder round about; thereforestevery point of Latitude in this Cylinder fo dilated, a

part of the Meridian obtaines the same proportion to the like part of the Parallell, that the like parts of the Meridian and Parallell have to each other in the Globe withour sensible errour. Now for a such as like parts of the wholes, have the same proportion that these wholes have; therefore the like parts of any Parallell or Meridian of the Spheare have the same proportion that the same Parallels and Meridians have: For example sake, as the Meridian is double to the Parallell of 60 Degrees, so a Degree, Minute, or other part, Is also double to a Degree, Minute, or other part of the Parallell; and what proportion the Parallell hath to the Meridian, the same must their Diatneters and Semi-diameters have one to the other: as is taught by Geometricians. Now the Sine of the Complement of the Parallels latitude or distance from the Equinoctiall, is the semi-diameter of the said Parallell; as in this Diagramme

bere inferted may easily appeares for A E the sine of A H the coplement of A F, the latitude of the Parallell A B C D stoke Equinoctiall is the semidiameter of the Parallel A B C D: & as



the semi-diameter of the Meridian or whole sine is to the semidiameter of the Parallell; sois the secant or Hypotenuse of
the Parallels latitude to the semi-diameter of the Meridian, or
to the whole sine, as FK (that is) AK, to AE (that is) GK,
so is IK to FK: therefore in this Geogra-phicall Chart, the
semi-diameter of each Parallell being aqual to the semi-diameter of the Equinoctiall or whole sine, the parts of the Meridian at every point of latitude, must of necessitie encrease
with the same proportion wherewith the Secants of the
Arch contained betweene these points of latitude and
the Equinoctial en-crease: out of which Geometricall

grounds thus explained, will arise a certaine and easie methode for the making of a table by the helpe of Trigonometry, whereby the Meridian in any Geographical or Hydrographicall table may truly and in due proportion divide it felf into parts, from the Equinoctiall towards either Pole: for taking for granted, that each distance of each point of latitude, or of each Parallell one from the other, to comprehend so many points as the secants of the latitude of each point or Parallell containes, we may draw out a table by continuall addition of the secants answerable vnto the latitude of each Parallell, vnto the fumme compounded of all the former Secants; beginning with the secants of the first Parallels latitude, & thereunto adding the second Parallels latitude, & to the summe of both thele, adding the third Parallels latitude, & so foorth in all the reft: and this Table will flew the fections and points of latitude in the Meridian of the Geographicall Mappe; through which fections the Parallells ought to be drawne : which Table we have lately fet out by Eaward Wright in his Correction of Nauticall Errours, to whom for further fatisfaction in this kind, I referre the diligent Reader. Out of the same grounds we may also deduce the Rumbes: for fith that the Chart (as we haue shewed) is nothing else but a plaine Parallellogramme, conceived to be made of the extension of a Sphæricall supersicies, inscribed in a concaue Cylinder, it must needes be that the Rumbes make a quall Angles with all the Meridians. Therefore if in the Chart a circle be drawne, divided into 32 aquall parts, beginning with the Meridian, paffing by the Center of that Circle, the lines drawne from the center of these section ons, will be the Rumbes for that place.

of the Geographicall Plaine-Chart we have fpoken, It behoues vs next to treat of the Geographicall Planispheare. The Planispheare is a table or map of two faces, whereon the lines are projected circularly.

Betwixi

Betwixt the Planispheare and the Plaine-Chart, a double difference may be observed: I That the former confifts altogether of right lines, as well in regard of the Parallells as Meridians: whereas the later is composed of circular or crooked lines, aswell as right. 2 The former may well be expressed in one forme or front, as we may see not only in the Nauticall and common Chart, which we have shewne to be all one with the other in respect of these Lines; but in many other common Mappes, as namely those of Hondins, whereas the Planispheare cannot beexpressed without two faces or Hemispheares; wherof the one represents the Easterne, the other the Westerne part of the Terrene Globe: For herein we must imagine a Globe to be cut into two aquall Hemispheares, which are at once reprefented to our fight: of this Description of the Earth by crooked Lines, Ptolomy in his 24 Chapt. of his Geography hath taught vs two wayes: whereof the first depends from the aspect of a Spheare, turned and moued round, in which all the Meridians are described as right Lines; but the Parallels as circumferences or crooked Lines. The other Delineation takes his ground from a Spheare presented to the fight, not moved, but resting stil in his place, in which both Meridians and Parallells are drawne circular. These two wayes of Ptolomy (howsoeuer indiciously invented in those times, wherein a small part of the Earth was discouered, and Geography very vnperfect) haue bin by later Geographers much reformed and corrected. Yet amongst the later haue not all expressed themselves alike: some haue pour- Oronina. trayed out the Earth in fashion of a Heart; some according to General sergaother figures: but in this (perhaps) as Painters, they have bin for. more indulgent to fancy, then common vie: others have gone about to expresse the Globe of the Earth in Elipticke Lines, which the Machanicians call ovall. But we as well in this as other matters, preferring choice before abundance, will content our felues with one ortwo, which vie hath stampt more current, and experience hathfound most viefull: to which as a ground we will premife this Theoreme.

The Planistheare is grounded on a certaine

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aspect of the Terrestriall Spheare, wherein the Eye of the beholder is so conceived to be fixed in some point of the Globe, that it may see the one halfe or Hemispheare.

Concerning the position of the Eye, two things are here remarkeable: I Where the Eye is supposed to be placed either aboue the convexe inperficies, or in the concaue: fome feeme to place it about the convexe superficies; of which opinion Gemma Frisus seemes to be, who would have the Eye to be set at an infinite distance: others although not admitting of such an infinite distance, deny not the Eye to be aboue the convexe superficies: but neither way can be warranted: Not rhe former, because of the impossibility of the supposition. For to imagine the Eye to be fet at an infinite distance, were to deny a fight or aspect which they would have to be the ground of this projection: For no object can be perceived, but such as is bounded and determined in a certaine and proportionate space. Neither can the later way passe cleere without exception; because to fuch a projection, fuch a fight is required which can fee the whole Hemispheare: for otherwise would it be vnperfect, and want of the perfection of the Globe: which containes two abfolure and entire Hemispheares. But now no place can be imagined without the Globe, wherein the Eye can be so placed, as to fee the one halfe or Hemispheare: forasmuch as it is imposfible from the opposite points of any Diameter, to draw two tangent lines which may meet together, or cut one the other in the same point, but willbe Parallell the one to the other: wherefore we may conclude, that the Eye in this projection cannot be imagined without the convex furface of the Spheare, but rather in the concaue: How the Eye should be imagined to be in the concaue superficies, may be in this fort explained, we must suppose a great Spheare of Glasse, or other such Diaphanous matter, inferibed with all his Patallels and Meridians, in fuch fort as they are represented vnto vs in the Globe, the Eye (according to opticall Principles) may be so placed neere the

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Center of it, as it shall beetable to see precisely the one Hemispheare described with all his circles, as we finde it in the spheare. I say necre not in the Center; because the Angle of vision (as we finde it taught in the Parssellmes) doth not extend to a right Angle, but is somewhat lesse: a we must inquire in what point in the superficies theeye is placed. To which we answer, that the place of the eye is of it selfe indifferent; because it may be imagined any where in what point soeuer. Neuerthelesse we will only fasten on two especiall waies which are of most viewherein the propositions following shall informe vs.

This Planispheare is twofold: the first wee tearme equinoctiall, which supposeth the eye to be fixed on some point of the equinoctial circle; the other Polar wherein the sight is conceived to bee fixed on the Pole of the Terrestriall Globe: The ground and fabricke of the former is taught in these Propositions.

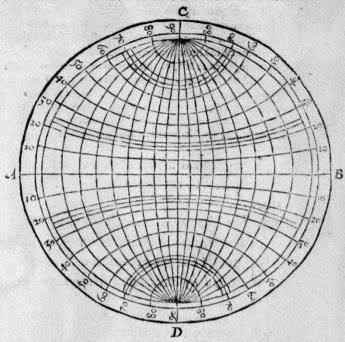
The eye conceined to be fixed on any point of the aquatour, will designe out vnto vs a Planispheare wherein all the circles are proiested eircularly, except the Æquatour & that Meridian which passet by the said point.

This may easily be shewne out of Opticke principles, we will suppose for example sake the eye to bee placed in some point of the Equatour: which shall bee 90 degrees of longitude from the Equinoctiall point: which kinde of proiection were have in many of our common Geographicall Mappes of the earth. In this manner of sight, if the terrestrial Hemispheare, which may onely bee comprehended by it, be distinguished by his Parallels and Meridians or-

dered and ranged by distances of equall Arches in such number as we pleafe: It is most certaine that the Eye, feeing distinctly and separatly every one of these Meridians and Parallels, will forme to it selfe so many visuall Pyramides, called by Geometricians Cones, which cones by this meanes will be Scalenes, &c will have for their Bases those Meridians and Parallels, the tops whereof will meet together in the fame point and eye of the beholder, which according to this supposition is the Pole of the Meridian, which paffeth by the Canaries, called the first Meridian, and representing vnto vs the Æquino Stiall colure. Now because these lines are cut by the plaine of the Meridian pasfing by the Canaries, it followes out of the fame grounds, that their common sections, and that of the Meridian are the portions of circumferences, which represent vnto vs in this Plaine the Meridians and Parallels seene in this maner of fight. Not withflanding that which is vnder the go degree of longitude, as likewife the Equatour, cannot (according to Opticke demonthration) be seene, but as right lines cutting one the other at Right Angles in the Center of the same Meridian of the Canaries: The Theory being expressed we will in the next propofition fhew the manner of projection.

How to describe the Meridians and Parallels in the ÆquinoEtiall Planispheare.

To shew the practise of this Theoreme, let there bee drawne a circle ACBD, as you see in this figure divided by two Diameters cutting on the other at right Angles in the Center into source Quadrants, or equall parts: whereof each one is againe to be divided into 50 degrees. In this the line AB is imagined to express the halfe of the Equatour, as the line CD of the Meridian; in which the two points C and D designe out the two Poles. Let a rule be drawne from the Pole C by every tenth or sist edgrees of the halfe circle ADB, and let every section of the Equatour and the rule be precisely noted. In like fort from the point B let the Rule be moved by every fit and tenth Degree of the semicircle CAD, and set every section of the rule and the Meridian CD be precisely noted. Then plane



cing one foot of the compasse in the line CD (which must bee drawne out longer, because in it the Centers of the Parallels must be found out) let the other be moued in order to every intersection of the Meridian noted out; and let so many circles be drawne as intersections, which circles will bee so many Parallels. The finding out of the Centers where the stedsast foot of the compasse ought to be fixed in drawing of each circle, is a matter appertaining to Geometricians: who have taught a way to bring any three points given into a circle, and to finde the Center from which it is described. Having thus described the Parallels, we must proceed on to drawe the Meridians in this manner; let the one foot of the compasse be placed in the

line A B, from which as the Center by every Interfection of the rule, and the Æquatour forenoted, let there be drawne so many circles as intersections; which circles so drawne will be the Meridians. If any man desire more curiously to be informed in the Geometrical Demonstrations, whereon this Fabrick of the Planispheare is grounded, let him read Gemma Frismude Astrolabio, Stifelims; but especially Gnido Vbaldim, who hath copsoully and accuratly handled this subject. Enough it may seem for a Cosmographer to shew the vie of it, as we shall hereafter in Geographical conclusions, supposing the Fabrick sufficiently demonstrated by Geometricians, to whom it of right belongs.

The ground and Fabricke of the Polar Planispheare, is taught in these Propositi-

ons.

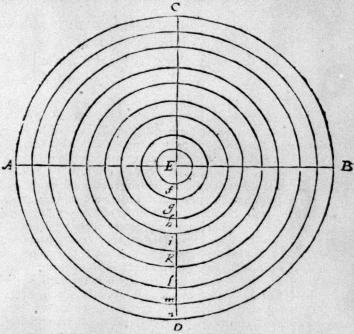
The Eye conceived to be fixed on the Pole will expresse in the plaine of the ÆquinoEtiall a Planispheare wherein all the Parallells are described by circles and Meridians by right lines.

This may likewise be optically demonstrated: For the Eye being supposed to be fixed on the Pole, the sight will formeto it selfeso many visuall Cones as there are Parallells described in the Spheare. These Cones being supposed a qually to be cut by the plaine of the Equatour, will have for their Bases the said Parallel circles represented in the plaine of the Equatour, as so many absolute circles; whereof the Equatour will be the greatest, and comprehending within it all the rest. Likewise the Meridians in this kinde of sight are supposed to terminate the sides of these Cones, and therefore according to the Optickes ought to be right lines.

2 How to describe the Parallels and Meridi-

ans in the Polar Planistheare.

This projection is easiest of all, as shall appeare by this Diagram. Let there be described a circle from the Center E which shall be A C B D: Let this circle be by two Diameters A B & B C divided into source quadrants: each of which may againe



be divided into 90 parts: every fift or tenth of these 90 parts being first marked out, so many Diameters may be drawne from either side to the opposite part by the Center E: which Diameters so drawne will serve for the Meridans. Then let 2-ny one of these lines be divided into 9 parts, and diligently marked out, as the Semidiameter ED by FGHIKLM Niby

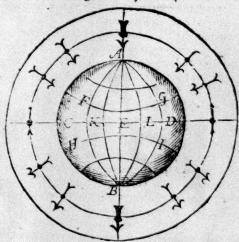
all which marks from the Center E, let there be drawné so many circles. These circles so described will be the true Parallels: This kinde of projection, though more vnusuall, yet wants not his speciall vie in describing the parts of the earth neare the Pole, which in our ordinary kinde of Tables projected after the other manner, cannot suffer so large and proportionall a Description.

representation of the Terrestriall Globe, we are in the next place to speake something of the Magneticall. The Magneticall is a

round Magnet called a Terrella.

This kind of Sphear hath bin by Gilbert aprly termed a Terrel-In, or little Earth, being the model & representatio of the great and maffie Spheare of the earth whereon wee dwell. Betwixt this kind of representation and the former, great difference may be observed. First because the former is grounded meerely on Artificial Imitation, implying nothing elfe but a Refect or application: whereas this magneticall Terrella not only represents Externally the Earth, but Internally out of its owne Magneticall nature and vigour, eminently containes and expresses all those motions and magneticall vertues, which we have formerly shewed to be in the Earth. 2 It skills not in the former of what materiall substance the Spheare confists, so the parts of it answere in due symmetry and proportion to the parts of the Earth; but this represents the whole as a Homogeneall part communicating the fame nature & substance with the whole spheare of the Earth. In the Fabricke of this Instrument wee must consider, I the Matter: 2 the Forme: The matter (as we haue already intimated) is a Magnetical substance which ought to be chosen out of a most eminent Mine, having all his parts pure and vnmixt, as possible we can finde in any Magnet . For though all Loadstones have the same inclination, yet in many the vigour is so weake, or at least so hindred by the mixture of fome

fome Heterogeneal matter, that they will not so well and sensibly performe their office. The forme of it is the roundnesse and politure, wherein Art should shew as much exactnesse as the can such a Spheare may well be expressed in this Figure, whereof we had formerly occasion to make vse: wherein the footsteps of this Magneticall vigour are sensibly expressed, no otherwise then in the great Body of the Earth.



- are chiefly to be noted, the inuentio of the Poles, 2 of the Parallells & Meridians: both which shall be taught in these Propositions
 - I To finde out the Poles in the Magneticall Terrella.

To performe this conclusion many artificiall waies have beene invented, I By the *Inclinatory* Needle: for being evenly hung in such fort vpon the Terrella, as may be seen in the former figure it will according to divers points diversly respect the Terrella

in his lite: wherelocue; then we shall finde it to fall perpendicularly at right angles, we may affure our selues that that very point is the Pole; which being once knowne, it will be easie to finde the opposite Pole, either the same way, or by measuring. 2 By the Veyne or Mine of the Loadstone: for (as wee haue shewed in our fourth Chapter of this Treatise) that part which was situated towards the North, will afterwards direct it selfe Southward, and contrariwise, the South point will respect the North, whence the Poles may be discouered. 3 By a little boat, wherein the Loadstone being placed on the water, will moue round till such time as with one Pole hee may point out the North, with the other the South. Many other waies may be inuented by Mechanicians, perhaps more curious, to whose industry I referre my ingenious Reader.

2 The circles in the Terrella are found out by

the Magneticall Needle.

This needs no other ocular demonstration then we have taught in the fourth Chapter, and may be conceaued in the former Diagramme; First weesee the magneticall needle according to diverse points diversly to conforme it selfe, which hath given way to ingenious artificers to finde out the Parallels and Meridians. The Parallels are found out by observing the Angles of declination of the Needle hung over the Terrella which are found in proportion to answere to the degrees of Latitude; which Dr Ridler in his Magneticall Treatise hath industriously calculated, as I have here inserted, to save others a new labour of calculation. The Meridians are more easily found by hanging any directory wier or needle over the Terrella; one end of which pointing towards the North, and the other towards the South, will discover the Meridian line.

A Table

CHAP. VIII.

Of the measure of the Terrestrial Globe

Itherto have we handled the Terreffriall Globe primarily: in fuch proprieties as absolutely agree vnto its nature.
In the second place wee are to handle such
as secondarily arise out of the former. Here
we are to handle two chiefe points. I The
Measure. 2 The Distinction.

2 The measure is that by which we find out

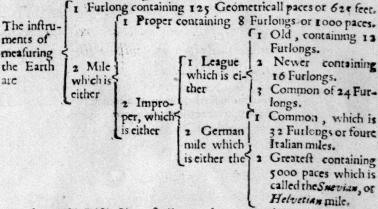
the quantity of the whole Earth.

Good reason have we to call this the Secondary part of Geography; forasmuch as these accidents and proprieties we here consider, arise altogether out of the former. In the former Treatise we have divided the Naturall Spheare of the Earth, from the Artificiall: But in this part, for avoiding of tediousrepetitions of the same things, we have loyned them together: For howfceuer the measuring and diffinctions of the Earth be truly grounded on the nature of the earth it felle; yet can it not be well expressed & taught without the material Instrument: we have therefore thought good to colider the measure of the earth, before we come vnto the Diffinction, because it is more fimple and vncompound, depending on the lineaments & meafure of one circle: whereas the Diffinction necessarily requires the conjunction and combination of diverse circles, as Meridians and Parallels compared one with the other, as shall bee taught hereafter. Whether the great masse of the earth can be measured, or no, seemes a matter not agreed on by all; Some have held an opinion that it cannot be measured, in regard of

the infinite magnitude wherewith they thought it endowed: which opinion feemes derived from fome of the Platonick s. who afcribing to the Earth another figure befides the Sphericall, have cast themselves vpon vncertainties, and being not able to reduce the Quantity of the Earth according to their owne grounds to any certaine measure, have denied it to bee measurable: But the ground of this opinion we have taken away before, in prouing the earth to be of a true Sphericall pature, and therefore circumscribed in certaine bounds apt to be measured. Another conceit more absurd then the former, is not only of the common people, whose condition might excuse their ignorance, but of fuch as would bee effeemed learned; who contend, that the greatnesse of the earth canot be measured: the onely reasons they can alleadge for themselues are, I That a great part of the earth is vnaccessible by reason of fleepe rocks, high mountaines, spacious & thick woods, moorish fogges, and such I ke impediments. 2 That the parts of it are for the most part vneuen, and subject to no regular figure. without the which no measure can be exact. The first cauill is of no moment; because whereas we affirme that the Earth by man may be measured, we hold it not necessary that it should be trauerfed ouer by journies or voyages. Forafmuch as to the finding out of the Quantity of the whole Terrestriall Spheare. it may feeme fufficient to know the measure and proportion of any little part in respect of the Heavens. As for example, what number of Miles, Leagues, or Furlangs answer to any degree or degrees in the Heavens: wherefore we suppose the Earth to be measured ouer not with our feet, but with our wits, which may by Mathematicall rules bee taught to march forward where our legges fayle vs: The second objection only proues thus much, that the Earth partaking of fo many vnequal parts & irregular formes, cannot in the measuring admir of so much exactnesse, as if it were endowed with one vniforme face : yet it is exact enough to content a Cosmographer, who measureth not by feet and inches, but by leagues and miles, in which wee little regard fuch a needleffe curiofity.

1 The common measure by which the quantity of the Earth is knowne, are Miles & Furlongs.

Here is to be noted that such instruments as serue for measuring are of two sorts, either greater or lesser; the smaller are of diverse sorts, as a Grame, Inch, Foot, Pearch, Pole, and such like Some of these how societ sometime vsetull in Topographie, can have little or no vse at all in the vast greatnesse of the whole Earth. Wherefore the Geographer seldeme descends so lowe, but takes notice of greater measures, such as are Miles & Furlongs; where we may observe by the way, that the vsuall measuring amongst the Grecians was by Stadia or surlongs, amongst many of the Latines by miles; under which wee also comprehend Leagues: these miles are diversly varied, according to the diversity of Countries, so that in some places they are esteemed longer, in other shorter; which differences may be learned out of this ensuing Table.



Howfoeuer this Distinction of miles may be many waies profitable, especially in the Topographicals part, yet shall we seldome make vie of any other then the common Germane mile, or the common Italian mile: To which as the most knowne, the rest may easily be reduced.

X 2

. The

3 The object here proposed to be measured is the Spheare of the Earth. The Dimensions according to which it is measured, are either Simple of Compound.

4 The simple is twofold, either the Perimeter, or the Diameter. The Perimeter otherwise called the circumference, is a great circle

measuring the Earth round about.

5 The Invention of the Perimeter of the Earth depends on these following Propositions.

fame Center, and from the Center to the Circumference be drawne two right lines; The Arches of all the Circles comprehended within the said right lines will be like and proportionall one to the other.

This Proposition being meerely Geometricall, is taken here as a ground without farther demonstration: whereof if any man doubt, he may have recourse to Clavim Commentaries vpon Iohannes de Sacrobosco. This principle granted will beget these two Consectaries.

- As one degree is to the number of correspondent miles, or furlongs, so all the degrees of the circles to the number of miles or Furlongs measuring the quantitie of the Perimeter of the Earth.
- 2 Wherefore one degree or portion of the Cir-

cle being knowned by his number of miles or furlongs, the whole Circumference may bee found out.

The reason of this consequence every Arithmetician can easly shew out of the Golden Rule: The chiefe point then of the invention consists in finding out the proportion of any portion, as a degree, halfe degree, or the like, to the number of miles or Furlongs answerable therevnto; for which purpose many skilfull Mathematicians have invented many excellent waies of great vie and delight.

By the elevation of the Pole, or observation of an Eclipse, or some knowne Starre, the cir-

cuit of the Earth may be found out.

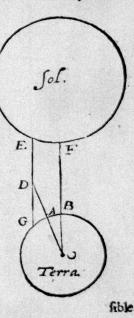
By the Elevation of the Pole it is performed after this maner: let there be observed two Citties, or other notable Land marks placed iust North and South under the same Meridian. In these rwo Citties, or markes, let the Elevation of the Pole be exactly noted. Then Substract the Elevation of the Southerne Cittle which is leffer, out of the Northerne, which is greater; the refidue containes the distance of these places in digrees; which being experimentally knowne by Miles, Halfe-miles, Furlongs or fuch like measures, will shew the true proportion betwixt a degree, and his number of miles: which being againe multiplied by 360, will shew the whole circumference of the Earth. For example fake, we will take two famous Cities of England. Oxford and Torke, which are fituated, it not exactly , yet very neere the same Meridian. The elevation of the Pole here with vs at Oxford is gr d grees and 30 minutes; at Yorke it is 54 degrees 30 minu:es, or neere there about : Subtract the leffer from the greater, the distance betwixt Oxford and Torke will be three degrees; which distance experimentally knowne in miles, will shew the proportion; which we shall finde to bee, (abating somewhat in regard of the crookednesse of the way) about 180, answering to three degrees of the Meridian: wherefore

wherefore to one degree will answere 60 Miles, which being multiplied by 360, the whole circle will produce 2 1600, the measure of the whole Earth. The like may be performed by an Eclipse in two Citties lying vnder the Æquinoctiall circle: two land-markes being once noted out, lying vnder the Æquino-Riall, let there bee observed in both the same Eclipse of the Moone, especially in the beginning: Now it being certainely found out how many howres the r cliple beganne in the one place before the other, we must resolue their howres into degrees, which is eafily done: for a much as to every houre anfweres 15 degrees in the Sunnes Diurnall motion, according to Astronomers. Now the diffance betweene these two Citties or markes (being supposed first experimentally to bee knowne, will eafily shew the correspondency betwixt the Degrees and miles, which is here fought. Another way is taught by Possidonius, as easie as the tormer, which is performed by some noted fixt Starre, as Oculas Tauri, Arthurus, Spisa Virgini, or any other; let there bee obserued under the same Meridian in the Earth two places, whose distance is experimentally knowne; in both these places let the Meridian alcitude of the Starre be fully and perfectly observed: The difference of these two Altitudes will be the number of degrees betwixt thefe two places: whence wee may observe how many miles, or other parts answere to the number of these degrees betwirthese two places. This way by Clavin is preferred before the former; forasmuch as it requires not in any place the knowledge of the Elevation of the Pole, which in any place cannot be certainely knowne, without long and diligent fearch, and observation: As for Geographicall Tables, they are not alwaies and at all times to be had, at least worthy credit.

2 By the observation of the Noone-shadowes the measure of the Earth may be found out.

This way was inuented by Eratosthenes a famous Mathematitian: who by observation of the Noone shadowes, observed at the same time at two diverse places, fitu to under the same Meridian, sound out the circumference of the Earth. The places which he chose for this purpose were Siene, and Alexandria, situated vider the same Meridian: the one inclining to the South, the other to the North. The Distance betwirt these two places is supposed to be knowne, whence hee proceeded in this manner: First heerected a Gnomon at right Angles on the plaine of the Horizon: when the Sunne was in the beginning of Cancer called the Solfice, from which he imagined two Rayes or Beames to be cast at Noone: the one passing by Siene the most Southerne part, the other by Alexandria the most Northerne: so that at Siene, the Sunne being then in the Solfice passed into the Center of the world: the place being supposed to have beene situate vider the Tropicke: The other passed by the Vertex of the said Gnomon: whence by proportion of the shadow to the Gnomon by a Geometricall kinde of working he found out the space betweene Alexandria, and Siene:

which demonstration, for more enidence we will here fer down-Let there bee in the Earth deferibed a circle paffing by Alexandria and Siene; in which let A be the place where Alexandria stands: B the place of Siene: the Gnomon or Style ere-Eted at Alexandria, AD. The Sun-beame carried to the Center of the world at Siena FBC. The Sun-beame paffing by the Vertex, or toppe of the Gnomon seated at Alexandria EDG. casting his shadow AG toward the North: let the Gnomon bee conceaued to be prolonged vnto the Center C: Now forafmuch as in the Triangle ADG. the Arch A G, without any fenfible difference may bee raken for aRight line, having an infen-



fible magnitude in regard of the whole Earth: and the Angle A is a right angle, and the two fides A D, and A G knowne: the former by supposition, being a Gnomon taken at our pleafure, the latter by any measure, or at least by the knowne proportion of the shadow to the Gnomon, according to the Do-Arine of Triangles: the Angle ADG will be knowne; For whereas the fides AD, and AG are supposed to be knowne, their Quadrats also will be knowne, which being aquall to the square made of D G, by the 47 proposition of the 1 of Euslide, the right fide D G will eafily bee known: out of thefe grounds by the doctrine of the Sines and Tangents is eafily found out the Angle AD G, and by consequence the alternate Angle A CB, which by the 27 of the first of Euclide is equall vnto it: forasmuch as the two Rady FB C and ED G may be supposed to be Parallels in so small a distance as Alexandria and Siene compared with the Sunne: the Angle being knowne the Arch A B subtended to the Angle C, will also be knowne, which is the space intercepted betwixt Siene and Alexandria; and for example fake: if Eratosthenes (as some write) found out the Arch A B, to containe in degrees 85, and experience had taught the length of the Journey betwixt these two Citties to haue contained 6183; Furlongs: It would appeare by the Golden Rule that 360 degrees containing the whole circuit of the Earth must proportionally answere 25 2000 Furlongs.

The opinions of Cosmographers concerning the measure of the Earth, are diverse: which is chiefely to be imputed to their errour in observing the distances of places experimentally according to Miles, Furlongs, or such like

measures.

How many Authors of great name and estimation have differed amongst themselves, every man may enforme himselfe out of this Table here inserted. These differences we finde diversly related: but of all others, which Authors have set forth,

42

The circuit of the wholecarth containes according to	Authors	Furlongs	Miles.
	Strabo and Hipparchus	252000	31500
	Eratosthe- nes.	250000	31250
	Possidonius & the anciet Arabians.	246000	30000
	Ptolomie.	180000	22500
	The later Arabians	204000	25500
	Italians and Germans.	172800	21600

I preferre the iudgement of Mr Robert Hues; Ferafmuch as it is not grounded on common tradition, but industriously by humfelfe deriued out of the Anceints by diligent fearch and examination, as by one, whose iudgement being armed as well with skill in the language, as the knowledge of antiquity, scornes to be injured by translation. What should be the cause of these differences, is a matter which thath staggered curious searchers into Antiquities more then the former. Fuery opinion being supported with the names and authorities of such renowned Authors, might challenge a pitch about the measure of my Decision: only I may not be thought ouer presumptu-

ous to confecture where I cannot define, especially having so good a guid as my forenamed Author, to tread out the way before me. Wherefore supposing as a ground, these Authors fo much differing about the measure of the earth, to have been in fome fort led by reason. The differences must needs arise out of one of these causes; either the errour or negligence of the ob scruers, in trusting too much to others relations without any farther fearth, or elfe the defect in the Mathematicall grounds out of which they derined their demonstration; or the diversity of measures yied in this worke : or finally, from the milapplication of these measures to the distances; whence may arise fome errour out of the experimental measuring of places in the earth. In the first place it may perhaps bee doubted whether Aristotle defining the measure of the Farth to be 400000 furlongs, were not deceaued by relations: forafmuch as hee avoucheth it, from the Mathematicians of his times, whose authori. ty and credit for ought we knowe, deferues as well to be forgotten as their names. But this answere might feem too sharp in the other: forasmuch as we finde them registred for Masters in their science, and such as could not easily bee cosened by others impostures. Neither can we imagine the second to bee any cause of their errour for the same reason: because the waies these Mathematicians vsed in finding out the circuit of the earth, are by writers of good credit commended to posteritie, as warrantably grounded on certaine demonstrations, being no other then what we have shewed, before, which admit of no Parallogisme. In the third place we ought to examin whether the diverfity of opinion concerning this matter proceeded from divertitie of the measures which were yied in this worke. Nonnius and Pencerus would needs perswade, that the Furlongs whereby they measured the earth were not the same: Maurelyeus and Xilander talke of diverse kindes of paces: Maurolyem labours to reconcile both, but without effe A. First whereas they would have diverse kinde of paces, it cannot bee denied: but in the meane time we cannot learne that the Grecians ever measured their Furlongs by Paces, but either by Feet. or Faddomes. A Faddome which the Greekes call ighuid is the meafure

nieasure of the extension of the hands together with the breast betwixt, containing fix feet: which is a kinde of mea-uring well knowne vnto our Marriners, in founding the depth of the Sea. This measure notwithstanding is by many translated a Pace: by what reason, let any man judge. Xilander in translating Strabo renders it an Ell: Secondly for a Furlong it containes according to Herodorns an ancient Grecian writer 600 Feet; which is also tellified by Suidas, being much later. A Furlong containes 100 Faddomes; euery Faddome foure Cubits. A Cubit. according to Horon, a Foot and halfe, or 24 Digits. Now for the varietie of Furlongs, it is true that Cenforinus makes three kindes. For either it is called the Italian confitting of 625 Feet, which is of mod regard in measuring the Earth; or the Olympian of 600 Feet: or the Pythian containing 1000 Feet. But to let passe this latter, we shall finde by serious consideration that the Italian and Chmpian Furlongs differ only in name, and are indeed the same. For the Italian containing 625 Roman Feet (according to Pliny in his fecond booke) is equal to the Olympian, having 600 Greeian Feet. For a Foot with the Gracians exceeds the Reman Foot by a twenty fourth part : as much as is the difference betwixt 600 and 625. Hence we fee how little certainty can be expected of fuch as goe about to reconcile these opinions out of the various vse and acception of the meafures. The most probable affertion then is, that the errour was grounded on this, that the distances of places, mentioned by the fore faid Authors, were not by themselves exactly measured, but taken vp vpon trust on the relation of trauellers, wherein they might eafily be mistaken. For instance we will take Erato-Sthenes and Possidonius, as of greatest credit, who are not withstanding taxed for many errours in their experimentall observations: whereas it is cleere that Ptolomy grounded his opinion on the distance of the places, exactly measured, as is witnessed. by his defignation of the Latitude of the earth fo farre as it was . discouered and knowne. Eratoft benes, for mistaking in the meafure of distances, is much taxed by Hyparchus, as wee finde in Strabo: For betwixt Alexandria and Carthage, he reckons about 13 thousand furlongs, whereas by a more difigent enquiry there

there are found to be but 9 thousand. Likewise Possionius is knowne to be mistaken, in that hee made the Distance betwixt Rhodes and Alexandria to be 5000 Furlongs, whereas out of the relation of Marriners, some have made it 4000, some 5000, as it is witnessed by Eratost henes in Strabo; who notwithstanding, sayes that he found by Instruments that it was not aboue 3750; and Strabo would have it somewhat lesse, as 3640. Manrolycus, going about to defend Possionius against Ptolomy, brings nothing but frivolous reasons voworthy so good an author. Out of all which hath beene spoken, our former Corollary will be manifest, that the diversity of opinions concerning the circumstrence of the Earth, arose from the experimentall mistake in the distances of places, where they trusted to other mens relations, rather then their owne knowledge.

6 The Diameter is a right line passing by the Center of the Earth from one side to the other, and measuring the thicknesse of it: the invention of which depends on these Rules.

1 As 22 is to 7 so is the circumference of a circle to the Diameter: wherefore the circumference of the Earth multiplied by 7, and divided by

2 2 will produce the Diameter.

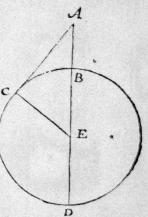
The exact proportion betwixt the Circumference of a circle, and the Liameter being the ground of the Quadrature of a circle, is a matter which hath fet aworke the greatest witts of the world: having notwithstanding as yet by no man been brought to discovery, insomuch as Prisseus, and other good Mathematicians, might well doubt whether ever it would come to light. Neverthelesse, where exactnesse cannot be found, were must come as neere as we can. The neerest proportion is numbers which any could yet light on, is as 22 to 7, which in so great & massie a body, as the Earth may passe without any sensible or explicable ersour. Supposing then out of our precedent Suppositions the whole

whole circuit of the Earth to be 21600 Italian miles (which is the common opinion now receased) I multiply according to the golden Rule 21600 by 7, whence will arise 1512 00, which being divided by 22 the Quotient will render 6872 % which is the Diameter or thicknesse of the Earth: some lesse curious are content to take only the third part of the circumference for the Diameter, which will be 7200, which account is lesse exact, yet sufficient for an ordinary Cosmographer: for assume as 328 miles, which is the difference, is of no great moment in the measure of the whole Farth.

2 By the knowne height of some mountaine without the knowledge of the circumference of the Earth, the Diameter may be found out.

This is a way inuented by Maurolycus, which proceeds in a cotrary manner to the former: because the former by the circumference first supposed to be knowne, shewes vs a way to finde out a Diameter: but the s, first seeks out the Diameter, by which

we may finde out the circumference: the practife is in this manner. Let the circuit of the Earth be conceaued to be BCD (as we fee in this Figure) in which let there be chosen an high Mountain whose Altitude AB may bee knowne by the rules of meafuring altitudes: then from the Mountaines top A, by the rules of measuring longitudes must the whole space of Sea or Land bee measured fo farre as it can be fren; so that the visuall Beame AC, may touch the Superficies of the Earth in C:let the space the which is feen in the Earth be B C, which



although in it selfe it be crooked and not plaine, yet can it not sensibly differ from a Plaine, for a finuch as the Arch BC, is extraordinarily

traordinarily little, if compared with the whole Earth. Thefe grounds thus laid, we must proceed by a Geometricall maner of argumentation in this fort. Here are to bee observed fours right lines; whereof the first is A B, the heigth of the mountain observed: the second is the visual Ray A C:the third A D confifting of the height of the mountaine, and the Diameter of the Earth. The fourth B C, the distance which is seene; for (as wee haue shewed) it may without sensible errour bee taken for a right line. Now forasmuch as A B, B C are knowne, their Quadrates by the 47 proposition of the first of Exclide, will also be knowne; which being aquall to the square of AC, the fquare of the right line A C will likewise be knowne. But the square of the right line A C, fith it toucheth the circle, will bee aquall to a Right Angle Figure contained vnder D A, A B, wherefore the right angle fo conceaued will be knowne. But AB is the knowne heigth of the mountaine, wherefore the right line AD will easily be knowne; if we divide the knowne right Angle contained under A B, A D: by the right line A B: for the Quotient will give the right line AD; from which if we subduct A B, the knowne heigth of the mountaine: then will remaine the Diameter of the Earth & D, which was here to be performed: from this invention will arife this Corollary.

The Diameter of the Earth first supposed to be knowne the circumference may be found out in this manner: as 7 is in proportion to 22, so is

the Diameter to the Circumference.

2 Wherefore let the knownenumber of the Diameter be multiplied by 22, and the Product be devided by 7, the quotient will give the Circumference.

As for example according to our former instance: Let vs suppose the Diameter of the Earth to bee 6872 s; this number being multiplied by 22, will produce 15120, which product deuided by 7, we shall finde in the Quotient 21600, which is the circumference of the Earth.

7 The compound dimensions, according to which the Spheare of the Earth is proposed to be measured, are either the Superficies or the Solidity.

8 The Superficies is againe twofold, either Plaine or Convexe: the Plaine is the space

included in the Perimeter.

The plaine Superficies may bee found out two waies: either by the Circumference, or the Diameter: both which vyaies are taught in these Rules.

it selfe, and the product be devided by 12; the quotient will show the Superficies included in the circle.

As in the former example wee will take the Circumference of the Earth to be 21600 Italian miles: let this number be multiplied in it felfe, and the product thereof divided by 12⁷, the Quotient will amount vnto 9270180, which is the plaine superficues of the Earth.

2 If the Semi-Diameter of a circle bee multiplied by the halfe part of the Circumferece: there will arise the measure of the Plaine' Superficies contained in the Circumference.

The reason hereof is showed by Clavius in his Tract de Isoperimetris Proposition, where is demonstrated, that a Right Angle figure figure comprehended of the Semi-Diameter of any circle, and the halfe of the Circumference will be aqual to the 'Circle it

felfe, of whose parts it is comprehended.

cies: the knowledge and invention of the Convexe, may bee performed two vvaies: either by the Diameter and Circumference; or else by the Space contained with in the Circumference, according to these Propositions.

I If the Circumference and Diameter be multiplied the one into the other, the product will show the number of square miles in the face

of the Terrestrial Globe.

As for example, let the Diameter of the Earth containing according to the common account 80111, fullongs, be multiplied by the whole circumference, which is 252000, there will arife the Convexe Superficies of the whole earthly Spheare which is 20205818181.

If the space contained in the greatest circle in the Spheare be multiplied by 4, there will be produced the whole Convexe Superficies of

the Spheare.

How to finde our the space or plaine Superficies, is a matter taught before; which being once found is easily multiplied by

4, and fo will give vs the number fought.

mension, according to which the Earth is measured is the Solidity, cossisting of Length,

Breadth,

Breadth, and Heigth, or Thicknesse: This may be found out two waies: either by the Diameter, and Convex Superficies, first supposed to be knowne: or by the knowledge of a great circle vvithout supposing the Superficies to be first knowne: both waies shalbe expressed in these Propositions.

I If the Semidiameter of the Spheare be multiplied into the third part of the Convex Superficies of the faid Spheare, there will arise the

whole Solidity of the Earth.

This is demonstrated by Geometricians: For a folide Rectar gle comprehended of the Semidiameter of the Spherie, and the third part of the Convex Superficies of it, will be equall to the Spheare it selse. As for example, if the Semidiameter of the earth containing 4009017 Furlongs bee multiplied by the third part of the Convexe Superficies containing, to wit, 673527273 there will arise the solidity of the earth, which will containe 2700232066115703 Cubick Furlongs. That is the solidity of the earth will comprehend so many Cubes, containing every side so many Furlongs, as there are vnities in the sad number: For the Area or spaces comprehended of Solide sigures are measured by the Cubes of those lines, by whose squares the Convexe Superficies of those lines are measured.

2 If the greatest circle be multiplied by ; of the whole Diameter: the product will show the

folidity of the Spheare.

This way is also demonstrated by Clavina in the same tract of measuring Magnitudes. It may Arithmetically be deduced in this fort. If any Spheare what sour hath a Diameter of 14 Palmes, and should be multiplied by 37, the circumference of the

the greatest circle containing it will be found to be 44; whose halfe being 12, if it be multiplied into the Somidiant etc. 7, there will arise the Superficies of the greatest circle 54, which number if we multiply by two third parts of the Diameter: that is by 93 there will be produced the solidity of the said Spheare, to wit, consisting of 14373 Cubick palmes. In the like fort may we worke by miles or furlongs in measuring the whole terrestriall Globe, which is a more convenient measure for the massic Globe of the Earth.

CHAP. IX.

Of the Zones, Climates, and Parallells.

F the Measure of the Earth vve haue treated in our former Chapter. In the next place vve must speak of the Distinction of the Terrestrial Spheare, vvhich is either in regard of Spaces or Distances.

2 Spaces are portions in the Spheare bounded by the Parallell circles: fuch as are the

Zones, Climats, and Parallells.

These are againe considered two vvaies; either in themselves, or else in their Adiunces or Inhabitants belonging to them.

4 A Zone is a space included betweixt two lesser

leffer and named circles; or elfe betwixt a leffer circle and the Pole of the world.

The spaces into which the Terrestriall Spheare is divided, are either Greater or Lesler. The Greater is a Hemispheare, which arifeth out of one only circle by it felfe, without the Cobination of more. Such are chiefly of three forts. The first is made by the Equatour: which disides the whole Globe into the north and the South Hemispheare. The second is of the Meridian, whose office it is to part the Earth into the Easterne and Westerne Hemispheares: The third of the Horizon, whi h divides the Spheare into the vpper and lower halfes: But these parts arifing (as I faid)out of one only circle, are handled before with the circles themselues. In this place wee are to speake of such parts, as arise out of the Combination and respect of circles one with another. Such as are the Zones, Climats, and Parallells. A Zone signifies as much as a girdle or band: because by it the spaces in the Earth are (as it were) with larger bands compas. fed about. The Grecians have formetimes given this name Zone to the Orbs of the Planers, as Theon, Alexandrinus in his Cotrent on A ratio, in thele words, Eger So wourds Clara in oft-Lievous To Zodano de, The fi reine exert Kobe @: + 3 Seurical ¿ Zove. There are (faith he) in the Heavens seaven Zones not conterminate with the Zodiack, whereof the first is possessed by Saturne, the second by Supiter &c. But this acception of the name is farre off from our purpose. The name Zone, as it is with vs in vie, is by the Latine Poets rendred sometimes Facia, sometimes Plaga: both signifying one and the selfe same thing: which is as much as a space comprehended within two Named and leffer Parallells: or at least betwixt fuch a Parallell and the Pole it selfe: because, as we shall shew hereafter Zones are of two forts: Thele Zones are in number five; which divifion hath beene familiar with our Latine Poets; as may appeare by thele verses of Virgil.

Quing, tenent cœlum Zona, quarum v na corufco Semper Sole rubens, & torrida femper ab l'one: Quam circum extrema dextrà lavág, trabuntur Caruleà glacie concreta, at á, imbribus atris. Has inter, Mediamá, dua Mortalibus agris Munere concessa Divúm, e.

Five Zones ingirt the Skies; whereof one fries With fiery Sun-beames, and all footched lies. 'Bout which the farthest off on either hand, The blew-eyed Ice and brackish showres command. 'Twist these two and the midst the Gods doe give

A wholfome place for wretched man to live.

Which description of Virgil little differs from that we finde in

Ovid, in theie Verfes.

Tarte secant Zona: quinta est ardentior illis:
Sic onus inclusum numero distinxit eodem
Cura Dei, totidemé, Plaga tellure premuntur.
Quarum qua Media est non est habitabilis astu:
Nix tegit, alta dua: totidem inter viramé, locanit.
Temperiemé, dedit mista cum Frigore Flammâ.
Two Girdles on the right hand, on the lest.
As many cut the Skies: more hot's the sist.
So God dividing with an æquall hand,
Into so many parcells cuts the land.
The midst through heat affords no dwellers Ease:
The deepe snow wraps vp two: but betwixt these
And the other Regions, are two places set,
Where frosts are mixt with sires, and cold with heat.

But because this enumeration and description of the Zones see downe by the Poets, seemes too popular and generall, we will more specially divide them according to the methode of our times in this manner.

The Zones are either *Intemperate*, or *Temperate*: the Vntemperate are against wofold either cold or hot.

6 The Intemperate hot Zone is the space con-

falle

tained betwixt the two Tropicke circles of Cancer and Capricorne.

How vnaptly these names of Temperate & Untemperate agree to the Zones, confidered in their owne nature, we shall speake in our fecond part: yet because I thought it vnfit to vie other tearmes then the Ancients, I will not coine new names. This Zone or space included betwixt the two Tropickes, circumfcribes within it two great circles, whereof the one is the Equator running iust in the midst, neither inclining to the North or South: The other is the Ecliptick obliquely croffing it and meeting the two Tropicks twice in a yeare, in the Spring and Autumne. The extent or breadth of this Zone then is a quall to the distance betwixt these two Tropicks, to wit, 47 degrees, which make 2820 miles: because from the Equatour to either Tropicke we account 23 degrees, which added and resolved intom les, will make the faid fumme: with in the compasse of this Zone are fituate, the greatest part of Africke, especially that of the Abyfines (which common opinion with little probability, would have to be the Empire of Prester John) also many Ilands as Iava, Summatra, Taprobana, befides a great part of the South of America called Pernana: It was imagined by the Ancients, as Aristotle, Pliny, Ptolomy, and many other Philo-Sophers, Poets, and Divines, that this Zone through extreame heat was altogether vnhabitable : for which cause they called it Intemperate: The reason of this coniecture was drawne from the fituation of this part in regard of that of the heavens. For lying in the middle part of the world, the Sunne must of necessity cast his rayes perpendicular, that is to say at Right Angles. Now according to the grounds of Peripateticke Philosophy the Idol of this age, the heat derived from the Sunne, arifeth from the reflexion of the Sun-beames against the furface of the Earth. Wherefore the heat was there conjectured to be greatest, where the reflexion was found to be greatest. But the greatest reflexion, according to all Mathematicians, must be in this Torrid Zone, where the Sunne darts forth his Rayes atright Angles, which reflect backe vpon themselves. Which

false coniecture was a long time continued by the exuberant descriptions of Poets, and defect of Navigation: having as yet scarce passed her infancy. But how farre these surmites come short of truth, we shall declare in our second part, to which we haue reserved those Physicall and Historicall discourses con-

cerning the qualities and properties of the Earth.

7 The Intemperat cold Zones are those which are included betwixt the Polar circles and the Poles: whereof the one is Northerne, contained in the Artticke circle, the other

Southerne in the Antarcticke.

Thele two Zones are not made out of the combination of two circles, as the former: but by one circle with relation to the Pole. The greatnesse and extent of this Zone is about 23 degrees and a halfe: which resoluted into Italian miles will produce 1380. The Northerne cold Zone containes in it Groinland, Fineland, and diverse other Northerne Regions, whereof fome are partly discouered, and set out in our ordinary Maps, other some not yet detected. For the other Zone under the Antarticke Pole, it confifts of the same greatnesse, as we know by the conflitution of the Globe, having other fuch accidents correspondent as the Northerne, so farre forth as they respect the Heauens. For other matters, they lie hid in the vast Gulph of obscurity, this port having never yet (for ought I knowe) exposed her selfe to the discovery of the Christian world. Whether these two Zones be without habitation, by reason of intemperate cold, as the other hath beene thought by rea fon of too much hear, we shall in due place examine.

8 The Temperate Zone is the space contained betwist the Tropicke and the Polar circle: whereof the one is Northerne contained betwixt the Tropicke of Cancer & the

Articke

Arttick circle: the other Southerne comprehended betwixt the Tropicke of Capricorne and the Antartticke circle.

Why these Zones are tearmed Temperate, diverse reasons are alleaged. I Because the Sun-beames here are cast obliquely on the furface of the earth, and by confequence cannot produce so much heat, as in those places where they are darted perpendicularly, if we only confider the confliction and fice of the heavens: For as we shall hereafter prove this may sometimes be altered by the disposition of some particular place. 2 It may be called the Temperate Zone, because it seemes mixt of both extreames partaking in some measure the both qualities of heat and cold: the one from the Torrid, the other from the Frigid Zones. 3 Because in these Zones the distances betwixt Summer and Winter are very remarkable, having a middle difference of time betwixt them, as compounded of both extreames. These temperate Zones included betwixt the Tropicks and the Polar circles are twofold as the circles: The northerne temperate Zone comprehended of the Tropick of Cancer and the Articke circle, containes in it the vpper and higher part of Africke, firetching even to the mountaine Atlas. Moreover lnit is placed all Europe, even to the Northerne Ilands in the Articke Zone, and a great part also of Afia: the other temperate Zone lying towards the South, is not fo well knowne being farre distant from our habitation : and awaiting as yet the farther industry of our English and Dutch Nauigators. The breadth of this Zone, as the other containes about 43 degrees which is the diffance betwixt the Tropicke and the Polar cirele, which multiplied by 60, will bee resolved into 2,80 Isalian miles.

1 The Torrid Zone is the greatest of all: next are the two Temperate Zones: the cold Zones the least of all.

the least of all.

The Torrid Zone is found to be greatest as well in regard of longitude

longitude as latitude, and is divided by the Æquatour into two halfes: the next are the Temperate; but the two cold Zones howfocuer equall in Diameter to the Torrid, are not with ftanding least of all: where is to be noted that every Zone is of the fame latitude from North to South, beginne where we wil, because it is contained betwixt two aquidiffant circles : but all iniov not the same longitude from East to West. For the parts of every Zone by how much neerer they are to the Aquatour. So much greater longitude will they have: by how much neerer the Poles they are, to much the leffe longitude: for almuch as the Parallells towards the Poles grow alwaies leffer and leffer. The invention of the quantitic of the Zones before mentioned, may briefly thus be performed. The latitude of the tor. rid Zone is fo much as the distance betwixt the Tropickes. which is Aftronomically grounded on the greatest declination of the Sunne being doubled: This declination being by (lavimand others found to be 23 degrees 30 ferup. which being doubled will produce 47: which againe multiplied by 60, are resolued into miles, will amount to 2820: though the odde scruples of many Authors are neglected. The latitude of the cold Zones is also drawne from the greatest declination of the Sunne: For the diffance of the Pole circles from the Pole it felf is just so much as the declination of the Ecliptick from the Æquatour, to wit, of 23 degrees 30 ferup. to which answere according to the former Rule 1420 Italian miles. The invention of the latitude of the temperate Zones depends from the Subtraction of the diffance of the Poles of the Ecliptick, from the Equatour; that is from the greatest declination of the Sun being doubled from the whole quadrant: in which subduction the refidue will be 43, to which will answere 2580 Italian miles.

The Zone wherein any place is feated may bee knowne either by the Globe or Geographicall Table, or else by the Tables of Latitude.

By the Globe or vniverfall Mappe wee may know it by the diligent

diligent observation of the foure æquidistant circles. For it we finde it betwixt the two Tropicks, we may without doubt, thinke it to be in the Terrid Zone: If betwixt the Tropick circle and the Polar, it will be in the Temperate. If betwixt the Polar circle and the Pole it selfe, it must be in the cold zone. By the Tables of Latitude it may be found this waie: Seek the latitude of the places given in the Table, which if it be leffe then 23 degrees 30 feruples, the place is in the Torrid zone. If precifely it be fo much in the Northerne Hemispheare, the place affigned is under the Tropicke of Cancer, which is the bound betwixt the Terred and the beginning of the Northerne Temperate zone: But if it be in the Southerne Hemispheare, it will be under the Tropicke of Capricorne: which ends the Torrid zone, and beginnes the South Temperate zone: Every place hauing more Latirude then 23 degrees 30 fcruples, vet leffe then 66 degrees 30 Minutes, is leated in the Temperat zone, either Northerne or Southerne as the places are in the Hemi-Spheare. If the place be precifely of 66 Degrees 30 minutes, it will be infly found to be vader the Polar circle, either Aritick or Antardicke. Finally cuery place whose Latitude exceeds the number of 66 degrees 30 minuts, is feated in the cold zone either Southerne or Northerne. If it reach iust to 90 degrees, it will be just under the Pole it selfe.

Of the distinctió of the Terrestrial spheare by Zones we have spoken: we must in the next place deliuer the Distinction of the earth according to Climates.

betwixt two Parallells distant from the Æquatour towards either Pole.

Climates are so called because of their Decknation from the Aquatour; for a front he are to be accounted as so many scales of ascents to or from the Aquatour. Some have defined it from the vie which is chiefly to distinguish the longest time.

time of the Artificiall daie: because at the point of every climate truely taken, the longest day is varied halfe an houre :although this account agree not altogether with Ptolomie, and the ancient Geographers before him, as we shall she whereafter. This distinction of the Terrestrial! Spheare into Climates is somewhat a more subtile distinction then the former by zones: foralimuch as that is made by the combination of fuch Parallels as are principally named and of chiefe note, as the Tropicks and Polar circles. But this indifferently respects all without difference. The first beginning and measure, as well of this as all other measures of the earth is the Equatour, for that which is most perfect and absolute in every kinde ought to be the measure of all others. But yet we must understand, that although we beginne our account of the Climats from the aquatour; yet the Equatour it selfe makes no Climate, but only the Parallells which are therevnto correspondent. For as it is before shewed, under the Equatour it selfe, the artificiall daies are all æquall in length, containing only twelve houres: wherefore beginning from the Aquatour betwixt that & the third Parallell, we count the first climate: from the third to the fixt, the fecond Climate: and fo all the rest, making the number of the Climates double to the number of the Parallells; fo that one and the felfe fame Parallell, which is the end, and bound of one Climate is the beginning of the next; whence we fee that to the conflictation of every Climate three Parallells concurre. whereof two are extreme, comprehending the breadth of the faid Climate, and one dividing it iust in the midst. A Parallell therefore differs from a Climate, as a part from the whole, being one circle correspondent to the Equatour, whereas a Climate is a space contained in three Parallells. Secondly, as a Parallell is conceaued to adde to the artificiall day one quarter or fourth part of an houre; so a Climate makes halfe an houre: fo that by how much any Climate is diftant from the Equatour, by so many halfe houres the longest day of that Climate goes beyond the longest daie of the place vnder the Equatour. These Climates therefore cannot bee all of one aquall quantitie; because the Equatour is a greater eircle, and comprehends

comprehends the greatelt space in the Earth: so that it must needs follow that these Climates neere the Aquatour being made by the combination of greater circles are greater then those necrer the Poles. But because all Climates are made by the combination of Parallells; we are to understand that there are three fort of Parallells to be knowne in Cosmographie: The first are those which doe distinguish the latitude of places, 12king their beginning from the Aguatour; and are in an ordinarie Globe or Mappe diffinguished, sometimes by 10, sometimes by 15 degrees. The second kinde of Parallells are those that make the zones, which are indeed some special named Parallells, as the Tropicks and the Polar circles: The third fort are called Artificiall Parallells; because they shew the distances of artificiall daies and nights, which are commonly noted in the margent of a Geographicall Mappe, which last fort of Parallell's are here chiefly to be understood.

1 The Zones and Climates agree in forme but differ in greatnesse, number and office.

The Climates are so called (as we have faid) because they decline from the Aguatour, and are spaces of the Earth containing two Parallells, in which the longest day is varied by halfe an houre. These agree with the zones in some fort: for both of them are spread by the latitude of the Earth, and by Parallell circles compaffe it about as fo many girdles: Nevertheleffe they differ one from the other. I In Greatneffe, because the zones are greater, the Cli nates lesser spaces in the Earth.2 In Number, because there are only fine zones, but many more climates. 3 In Office, vie and effect, because the zones are to diffinguish the mutation of the quality of the aire and shaddowes according to diverse Regions of the Earth: but the Climates are vied to fhew the greatest differences of houres in the day to shew the variation of the rising and setting of the starres, for places under the same Climate haue the same quatity of daies and nights, the same rifing and fetting of the stars, whereas places feated vnder diverte climats have a great variation in the daies and nights, and a diverse rifing and setting of the starres; for as often as the longest or Solstitiall day of one place, differs from the longest day of another by the space of halfe an houre, a new Climate is placed; where fore under the Equatour or middle part of the earth the daies are alwaies acquall, to wit, of 12 houres: which beginning from the Equatour, if we approach towards either Pole, so farre as the greatest artificiall day amounts to 12½, were may assure our selues that we are come to the first Climate; and so forward shill the greatest day of our Climate will by so much exceed the greatest day of the other. As the Climates differ one from the other by halfe houres, so the Parallels by quarters, as we have shewed; and shall more fully explaine in this Chapter.

2 The Climates compared one with the other,

are not all of the same greatnesse.

Although the Climates are placed according to aquall increase of daies and nights, yet suffer they a great inaquality: For no clime is aquall to another in the same Hemispheare, but are still greater the nother, by how much never they are to the Equinoctial circle; for the latitude of the first Climate is reckned to be about 8 degrees, which make 480 Italian miles: but of the last not so many minuts as quarters of miles.

In Terrestriall Climates, two things are to be understood; I The Invention: 2 The Distinction. The Invention teacheth the manner how to find cout in what Climate any place lieth. The finding out of any climate depends upon the observation of the length of the day; for the length of the day being once knowne, the Climate will also be found out by this Rule.

Double the houres about 12, and the Product will shew the Climate. The

The reason of this rule is intimated before; to wir, that the elimates are diffinguished the one from the other by the space of halfe an houre of the longest day: Now the daies under the equatour are alwaies aquall, containing 12 houres in length; from which towards the Pole they are increased by degrees: wherefore the number of the Climates must needs be double to the number of houres about 12: as for example, if I should finde out in what Climate England is situated: I find the length of the longest day to be about 18 houres, which is fix houres more then 12; this I double, and it will bee 12; whence I collect, that England is fituated under the 12 Climate: A more compendious way of finding out the Climate of any place, is by a certaine Table, wherein against every Elevation of the Pole is fet the just Climate: which Table we shall infert hereafter. Here must be noted that this rule which wee have raught is to be understood of the Climates as they are abforlute in nature, and not of Ptolomyes Climates: If any man would finde out the Climates of Prolomie, hee must first cast away three quarters of an houre, which is 45 minuts; because his Climates, as we shall shew, beginne not immediatly from the Equatour, but from the latitude of 12 degrees.

Thus much for the Invention: the Diftinction of Climates is into Northerne and Southerne Climates: both these agains are of two sorts, either proper or improper.

are placed between the Æquatour and the point neere the Polar circle: The improper are those from the Polar circle to the Pole it selfe.

We must viderstand that the Climates are considered two manner of waies, 1 Absolutely in respect of the whole Torrefirsall Spheare. 2 Comparatively, in respect of the knowne habitable.

bitable part of the Earth: According to the latter confiderati-- on the ancient Geographers have otherwife diftinguished the Climates then the new writers: whence arifeth a great difference and confusion amongst them, in defining the number of the Climates. For fometime they will have a new Climat put whenfoeyer the day increafeth a quarter of an houre : fometimes at halfe an houre, fometimes at difference of an whole houre or day. But the doubt is eafily answered, and reconciled by our former diffunction; for whereas they put the difference of Climates to be halfe an houre, it is to be vaderstood of thefe which are proper Climates betwixt the Equatour and the Polar circle; for it is certaine that beyond this circle the artificiall day increaseth, not only by houres, but by daies, weekes, and months; so that another account must be made of such Chimats then of the former. But it hath beene generally taken for those Climates of the Ancients: now the distinction of Climates among & the Ancients is of two forts. The first was of the Geographers before Ptolomie who placed the vttermost bound Northward in the 25th degree of Latitude or Elèvation, & fo made only seatten Climates. These 7 Climates were all understood to be in the habitable parts wherein they were marked and defigned out vnto vs by names taken from Citties, Mounsaines, Regions, and fuch like remarkable places, where wee are to conceaue that climate as neere as may bee gueffed to runne through the middle of any such Region, whereof it taketh its name: But the better to understand the Distinction of the Climates, as well with the Ancient as Moderne Cosmographers, we will infert this following Theorem.

I In the placing and Number of the Climates and Parallells, there is a great diversitie betwixt the Ancient and Moderne Geogra-

phers.

This hath beene before mentioned; but for better diffinction we have referred the handling of these differences to this proposition

polition, which may fe ue as a Corollary to the rest! First wee take it as granted that Ptolomie fo appointed the Parallells (out of which the Climates must arise) that hee numbred 38 both waies from the Equatour: to wit, 38 rowards the South, and formany towards the North. These Parallells he so diffinguifhed, that 24 he numbred by quarters of houres, foure by halfe houres, foure by whole houres, & fix by whole months. Hence is it that Geographers fay, that a new Parallellis to be placed fometimes whereas the longest day increaseth by a quarter of an houre; fometimes where it increaseth by a halfe, fometimes by a whole houre, fometimes by a whole moneth. The first is to be understood of those 24 Parallells which were delivered by the Ancients before Ptolomie. The fecond, third, and fourth of fuch as were voknown voto those Ancients before Ptolomie. To reduce all into order we will fet down this distinction. The distinction of the Climats is either ancient or new. The Ancient was againe twofold: either former or later. The former was that which was fet downe before Prolomies time, wherein there were affigned 7 Climats according to the common opinion (though Mercator grants but 5) These Authors placed their Northerne bound in the 25 degree of elevation: The later distinction was almost the same, but somewhat corrected by Prolomie, who placed 9 Climates towards the North. The first passed by Merce a Citty of Athiopia, where the longest or Solftitiall day is 13 houres. The second by Siene in Agypt, where the longest day is 13!: The third by Alexandria in Agypt, where the logest day is 14 houres, The 4th by the Iland of Rhodes, where the langest day is of 14!. The fift by Rome, where they have the length of the lorgeft day 15 houres. The fire by Ponta, where the longest day is 15 houres. The seaucath by the mouth of Borifthenes where the longest day is of 16 houres. Neverthelesse some haue drawne the 6 Climate by Borifthenes in Sarmatia, and the feaventh by the Riphaan mountaines. Ptolomie to this number addes two more, and so reckons them that the 8 should passe by the Ripham mountaines, and the 9 by Denmarke where the day at longest is 17 houres. To these Northerne Climats they opposed

opposed so many towards the South, which they called Anticlimates. These as it should seeme in Itolomies time were Imaginary altogether, because few or no places were discouered at that time beyond the Line. But to leave Prolomie and his old Authors, and examine the industry of later Geographers, we shall finde the Distinction of the Climats to be twofold; either ynperfect wherein they numbred onely 10 Climats; or perfect, wherein they accounted 46 or 48, of which 32 or 24 were North :rne, and the other on the opposite part, to wit, in the South. The perfect diffinction of the Climates is againe (as later writers speake) either certaine or vicertaine. The certaine they call that wherein the Climes are distinguifhed and ranged from the Equatour to the Polar circle: For fithens the Northerne Regions are now discouered beyond 70 degrees of the Elevation of the Pole, and a Climate is defined to be a space comprehended betwixt three Parallells in the habitable Earth: wherein the length of the longest day is increafed by halfe an houre; Therefore it must needs be, that from the Equatour to that habitable part of the Earth, wherein the longest day is 24 hourss (which is not far from the Pole circle) there should be placed 24 Climats. The vncertaine distinction they call that which is betwixt the Polar circle, and the Pole it felfe, which may be tearmed Improper; because in these Climats the day is not increased by halfe houres, as in the former. but first by whole Daies, then by Weekes, and last of all by whole Moneths: Infomuch that under the Pole it felfe they haue 6 Moneths perpetuall day, and to long againe a continuall night, The Parallells whereof the Climats are made, were fet downe by Ptolomie 38 (as we have faid) but the later writers have placed them so farre Northernely, that they reach to that tract wherein the Suntairies about the Horizon a whole 24 houres, and so have numbred 23 or 24 towards the North, and so many towards the South. The cause of this divertitie is because some drawe the first by the mouth of the Redde - Seat others by Meroe: for the farther confideration of these climats corrected by later Geographers, they beginne their account from the Equatour it selfe, which in this case is the best rule of certainty

certain'y: because we hold that whole tract of Earth to be habitable, as we shall proue in our second booke.

14 A Parallell is a space wherein the longest day is increased by a quarter of an houre.

Cencerning the Parallells, little can be taid more then we have epened in the doctrine of the Climats; for (as we shewed) the one cannot be well understood without the other; onely to avoid an biguity of speech, wee must consider that a Parallell may be taken either for a Line or Circle, in which sense we took it in the fife Chapter; where we divided them into Named or Namelesser elles for a space bounded by circles as we here understand it. The neglect of this distinction hash made some Geographers speake sometimes improperly. The Parallell is found out by this rule.

be multiplied by 4, and the Product will show the Parallell.

The reason is given before in the doctrine of the Climater, bescause the Parallell space, according to Latitude, is but halfe the Climate: so that as infinding out the Climate for any place we ought to double the houres of the longest day about 12: so here we ought to quadruple them, which is to multiply them by 4: As for example at Rome we finde the longest day to be about 15, which exceeds 12 by 3; which being again multiplied by 4, will produce 12, which is the Parallel for the place.

2 The Parallells no where divide the Climats into two equall parts.

In the Climates we are to confider two things, either their latitude or breadth from North to South; or their, longitude or extent from East to West. In respect of the former wee may hardly without sensible errour call the Parallell halfe the Climate, in regard the three lines whereof the Climate confists, to wir, the middle and the two extreames, are not alwaies of like this dance: but if we consider the extent of the Circumserence as

it Aretcheth it selfe betwixt East and West, we must needes acknowledge much moresto wit, that of two Parallels, dividing the same climate betwixt them, that that is manifestly the greatest which is next the Equator, and that is the least which is necreft to the Pole: because the Circles which comprehend their Parallel spaces, continually decrease towards the Pole: fo that if we imagine two men to travel round about the earth the one in a Parallell neerer the Equatour, the other neerer the Pole, in the same space of time; it must needs follow that hee should goe farre faster which is neerer the Equatour then the other neere the Pole: for how foeuer Columella feemes to make a Parallell to have in breadth 60 foot, and to intimate by consequence an aqualitie of the Parallells amongst themselves. yet must this be vaderstood of Parallells which are neere one to the other neere the Equatour, which comprehend a great space of land, and admit no sensible difference. Other matters which concerne the Climates and Parallells, shall be God willing) vnfolded in our Tables in the next Chapter, when wee have spoken of the Inhabitants, and such other adhines appertaining: without the which this treatife will be vaperfeet, depending for a great part on such circumstances as our method admits not in this place, but immediatly follow.

CHAP. X.

Of the distinction of the Inhabitants of the Terrestrial Spheare.

Auing hitherto treated of the distinction of spaces bounded by circles in the Terrestrial Globe, to wit, Zones, Cli-

mates,

mates, and Parallells; we are now to treate of the Inhabitants; as fuch adjuncts as properly belong to such spaces; so farre as it concernes the constitution of the whole Spheare.

the distinction of the Inhabitants is twofold, either Absolute or Comparative: Absolute as they may be considered in themselves without any comparison of one with the other.

the Position of the Spheare, or the differences of their Sun-Shadowes: According to the position of the Spheare the Inhabitants may be said to hauceither a Right, Oblique, or Parallell Spheare according to their Horizons.

What these three Spheares are, may appeare by that which we have formerly spoken concerning the distinction of Horizons in the first Chapter of this Treatile, and therefore needs no farther repetition: we are in this place to treat of the severall accidents, and conditions of the Inhabitants. Out of the distinction of the threefold Spheare will arise 13 manners of habitation: which for more order sake, wee will reduce into certaine heads in this manner.

4 The people of a right Spheare are such as inioy a right Horizon, whose proprieties shall be declared in this Theorems.

The Inhabitants of a Right Sphear in respect of the heavens have the same accidents.

These accidents are chiefly soure, I They inioy a perperual! Equinoctiall, having their daies and nights alwayes aquall tie one to the other: because the sunne never swaruing from his Eclipticke, hath his course aqually divided by the Horizon. 2 With the all the starse qually fet & tire; because all the Paralells wherein the starres make their Diurnall Revolution are agually cut by the Horizon. 3 To them the Sunne is twice in the yeare verticall, that is directly ouer their heads, and twice againe in the yeare Solftitiall: The former in the first degrees of Aries and Libra, the latter in the first degrees of Cancer and Capricerne: which diverse positions of the Sunne, some later Geograpiers haue-tearmed foure Solftices: two higher and two lower. 4 Hence comes it to paffe that they yearely enjoy two winters, and two Summers: likewifeitwo fprings & two Autumnes. Their Summer when the Sunne is to them verticall: their winter when it is feated in either of the Tropickes. Their Springs & Autumnes while the Sun is paffing through the middle spaces betwixt both.

The people inhabiting an Oblique Spheare are such whose Horizon is oblique. The proprieties belonging vnto them are either

Generall or Speciall.

6 The Generall are fuch as agree to all those which inhabit an oblique Spheare.

1 All the Inhabitants of an oblique Spheare

agree in two proprieties.

These two proprieties wherein they agree are these. I To all the Inhabitants without the Equatour under what Parallell sever, the daies are equal to the nights only twice in a yeare, to wit, either in the beginning of the Spring, or the beginning

of the Autumne. At other times either the daies increase about the nights as in the Summer, or good lesser as in the winter. 2 To these inhabitants some startes are perpetually seenes, as such which are negre the Pole to which they incline some are never seene, as such as are farthest off from the said Pole; some rise and set, which are those which are in the middle space betwixt both; which are sometimes visible, and sometime lie hid.

7 The special Accidents of an Oblique Horizon, are such as agree to special places in the same Spheare.

The Inhabitants of an Oblique Spheare are of fine forts, iniozing so many correspondent properties.

The first fort are of those, whose Zenith is betwist the Equater and one of the Tropickes, even vnto the 23. Degrees, 20. Scruples of elevation of the Pole: In fuch a fort, sowards the North betwixt the Line and the Tropicke of Cancer, are placed the inhabitants of Zeilan, the extreame part of the East Indies, Hispaniola, Guinea, Nuhia, with some part of A. rabia falir, and all other places betwirt the Aquater and the Tropicke of Cancer in the Torride Zon: Towards the South in the fame Latitude, are placed the Brafiliam, the Per ruvians, the lauans, with many others. The Accidence which happen varo these Nations are these, r. They may see all the flarres except a few which are neare the Pole. 2. Their dayes and nights are somewhat vnzquall, so that their longest days or longest night, is not alway of the same quantity. 2. Twice in the yeare they have the Sunne verticall, but without the Agnator. 4. They have two Summers, and two Winters, but not aqually rempered. 5. The length of their longest day reacheth to 13. 1 houre.

The fecond fort are such as inhabite vnder the Tropicke it selfe, whose elevation of the Pole is equal to the great the Bb 2 clination

clination of the Sunne, which is 23. degrees, 30. Scruples. Vader the Tropicke of Cancer is placed a great part of Arabis falix, East India, the Southerne parts of China, the higher parts of Egypt, and Siene. Vnder the Tropicke of Capricorne are placed the people of Monomotapa, and Madagascar, with other places: The accidents belonging vnto them are thefe, 1. To them appeare all the starres comprehended in one of the Circles, but none of the other. As for example, to those inhabiting the Tropicke of Cancer, the starres included within the Articke Circle alwayes appeare, but neuer those which are in the Antarcticke: likewise to those which dwell under the Tropicke of Capricorne, all the starres appeare which are contained within the Antarticke Circle, but none of those included within the Articke Circle. 2. By how much nearer the Sun approacheth to their Zenith or Verticall point, by fo much are their dayes lengthened; and by how much farther it goes off, by fo much are they shortned: so that they inioy then their longest day, when the Sunne directly peffeth by their Zenith. a. To them the Sunne is verticall but once in the yeere : to wir, to those vader the Tropicke of Cancer, when the Sunne enters Into the figne; as to the other when it toucheth the first Degree of Caprisorne. 4. They have but one Summer and one Winter throughout the yeare.

The third fort, are such inhabitants as dwell in one of the semperate Zones betwixt the Tropicke and the Polar Circles from 24. Degrees of eleuation, to 66. Degrees, 30. Scruples. Such inhabitants towards the North, are (as we have shewed) almost all the inhabitants of Europe, Asiamaior, and part of Africa: as on the other side towards the South, the Chylienses, the farthermost Africans, and those that dwell neere the straits of Magellane. Their properties are chiefly these, 1. Many startes are by them alwayes seene, and many neuer appeare.

3. Their dayes notably differ in inaqualitie.

3. The Sunneneuer asrives at their Zenith, but is alwayes on the South of those which inhabite betwixt the Tropicke of Canter, and the Articke Circle, and alwayes on the North side of such as dwell in the opposite temperate Zone.

4. They have in the

yeare but one Summer and Winter, but by reason of the diuersitie of places much vnz quall: for where the eleuation of the Poleis greater, the winter is much harder; but where it is

leffer it is more temperate.

The fourth kinde of inhabitants, are those which refide vnder the Polar Circle, (which is their Zenith) where the temperate Zone endes, and the cold beginnes: where the elevation of the Pole is beyond 66. Degrees 30. Minutes, in which Tract lies Nona Zembla, with many other Hands not yet well discovered in the North; and perhaps as many more under the Antarticke Circle towards the South, leffe knowne than the other. The accidents belonging to them are these, 1. Those which inhabite under the Arcticke Circle, see all the starres ineluded within the Tropicke of Cancer, but neuer those within the Tropicke of Capricorne: Likewise, those which live under the Antarcticke Circle, see all the starres within the Tropicke of Capricorne, but never those within the other Tropicke of Cancer. 2. Their longest day at Midfammer is 24. houres, their night then being but a moment : likewise their longest night, as at Mid-winter, is but 24. houres, their day passing not a moment. 2. The Center of the Sunne every years twice toucheth attheir Horizon. 4. The Sunne at Noenetide is alwayes on the South of those which dwell vader the Ar-Aicke Circle, except at bein the Summer Tropicke, when it is the Mid-night, or Northerne point; likewife to those that are vnder the Antar Ricke Circle, the Sunnear noone is alwaics on the North fide, except under the Winter Tropicke. 5. They have in the years one Winter and one Summer: but the Winter farre colder, and the Summer flacker then in the forenamed places.

The fift and last habitation, is of these which are included betwire the Polar Circle, and the Pole it selfe, from 66. Degrees and 30 minutes of eleuation to 90. In which Tract, little is discovered Northward, and in the South climate nothing at all. The special Accidents appertaining to them are these, 1. With them a few starres are seene to set and rise.

2. They have an Equinore the Sunne touching the first De-

gree of Aries and Libra. 3. They of the North Zone have more dayes about the middle of Summer, and more nights in the Winter: likewife they of the South frozen Zone, the contrary. 4. They have extreame cold Winters, and in flead of Summer, a finall remission of cold. 5. The figures of the Zondiacke to them preposterously rife.

8 The inhabitants of a Parallel Spheare are discoursed in this proposition.

i The inhabitants of a Parallell Spheare enjoy but one kinde of habitation, inrespect of the Heavens.

A Parallell Spheare I here accurately understand for that postsure of the Globe, wherein the Pole of the world is precifily placed in the Zenith, or elevated to go. degrees of Altitude: because onely in firch a fite, the Equator and the Hotizon igree in one, and he parallell to all the rest of the Parallell Circles : which places, whether it be at all capable of habitation by reason of cold, we shall discusse hereaster in the ledond part: but out of supposition admitting a place of habication, these accidents will happen, 1. The fixt starres which they fee, are alwayes feene fo, that with them there is no point of East or West; for the starres never rise nor fer. But the Planots rife and fet, but not by their diurnall, but proper motion. 2. They have a continual day of fixe moneths, and a night alfo as long, the Sunne rising continually in the first degree of Aries, and ferting in the first of Libra. q. The fun in the Æquinoctiall points, for all the time that he is about the Horizon(as all the other starres) is turned round about in manner of a whicele. 4. The Equator ferues in place of the Horizon, and the Equator is every while aquidiffant from the Pole . They have one Winter and one Summer, the former exceeding cold, the latter leffe warme then ours. 3

9 The second distinction of the inhabitants

of the earth is taken from their Noone final-

The Sunne in divers parts of the earth diverfly spreadship-Shaddow, I ecause the Gremons or Opacous bodies by which the shadowes are made in the earth, are in dicers places diverily opposed, or objected to the Sunce: for whereas the Sunne forunnes in his Eclipticke Circle betwixt the two Poles, that though his passage be in an oblique Circle, yet he never comes so farre as the Poles themselves: t necessarily must be. that fomtimes he should shoot forth his beames perpendicular. ly, as when it is in the verticall point of a place; sometimes Obliquely, as when he declines either one way or other from the verticall point; fornetimes in parallell wife, torasmuch as in some places of the earth, the Sunne cleaning as it were to the Horizon, casts out his beames parallell and aquidestant to the plaine of the Horizon. The right or perpendicular beames of the Sunne, falling on the superficies of the earth at right Angles, are turned and reflected into themselues, and so make no shaddowes at all. But the oblique beames, in that they are not reflected into themselves, must of necessity produce shaddowes, yet in divers manners; for those Sun-beames which obliquely project themselves on the plaine of the earth, so as they come not from the Horizon it felfe, will make fuch kinde of shaddowes as shall proportionally agree with their Gnomens, or Opacous bodies, and fuch whose magnitude may in a manner be defigned out, and certainly measured by the fight. But on the contrary part, the beames which are effecmed parallell to the plaine of the Horizon, finding no folide obstacle or let, shoot foorth infinitely, making no Angels on the superficies of the earth, and can have no proportion at all with their Gnomons, that the shaddow may be any way defigned by our eyes. But here we are to confider, that the shaddowes chiefly to be confidered, are the Meridian or Noone-Shaddowes, which take their distinction from the divers incidencie of the beames, which the Sun casts forth at noone. According to this manner, Cc to The

of the shaddowes, are either Amphiscip, Heteroscip, or Periscip. The Amphiscip are those, whose Neone-shaddowes (but at divers times of the yeare) are cast both wayes; that is to say, North and South.

Amphisive fignifies as much as people of a double shaddow: such are they which inhabite betwirt the Equator and the Tropickes, where the eleuation of the Pole aquals not 24. degrees: These men haue the Sunne twice every yeare in their Zenith or verticall point, and then they make no shaddowes at all; and therefore they are called Asig, or without shaddowes. But when the Sunne passeth from their verticall point towards the Northerne signes, then at noone it will call the shaddow towards the Southerne coast: But contrary wise, comming from the Zenith toward the Southerne signes, the shaddow will be darted toward the North, which is evident out of the Opticke principles; because the shaddow is alwaies found to be opposite in place to the Sun-beames, the Gnomon, or darke body interposed.

11 The Heterosey are those, whose Noone-shaddowes turne onely one way: that is, either toward the North, or tovvard the South:

These Nations inhabite in a temperate Zone, betwirt the Tropicke and the Polar Circles, whereas such as dwell in the temperate toward the North, betwirt the Tropicke of Cancer, and the Polar Circle Article, have their noone-shaddowes cast Northward. But those on the other side of the Equator, dwelling betwirt the Tropicke of Capricorne, and the Anatarlike Circle, cast their shaddowes Southward: Of the for-

mer fort are Grecians, Italians, French, Spaniards, Germans, Polonians, Suedians, Danes, English, and the rest inhabiting our temperate Zone: which gaue occasion of that speech of Lucan the Poet, concerning the Arabians comming into Thessaly, in the warre of Hanniball and Pompey;

Ignotum vobis Arabes venifis in orbem, Vmbras mirati nemorum non ire finistras. Y'are come Arabians to an vnknowne land,

Wondering the shades nere take the Southward hand. Which verses are in this sense to be understood; Poets are said to looke and turne their faces towards the West, so that the South must of necessitie be counted the less side: Now the place whereunto the Arabians came, being a part of Thessay, where such dwell who onely cast their shaddowes one way, to wit, Northward; but Arabia their natural Countrey, being supposed to be included in the Torrid Zone, where the shaddowes were said to be cast both wayes, they are said to wonder: The reason why our shaddowes at noone are cast alwayes toward the North, and the others toward the South, is related before, to be because the shaddow doth alwayes occupie or possesses, to be place opposite to the Sunne, or light body.

12 The Perifcij are fuch inhabitants whose shaddowes are mooued round about them in a circular forme.

In some places of the earth the Noine-shaddones take not their beginning from our heads, but of one side, and are extended forward to the plaine of the terrestriall Horizon, and so mooned round about the Opacous body, as about a Gnomon: whence they are called Perisci; which is as much to say, as men having shaddowes mooned round about; such is their habitation which are included in the Frigide Zone, circumscribed within the Polar circles, and the Poles: Here the Sunne never directly passet by the crowne of their heads, but at one side: so that they have the Pole for their verticall point, but

the Æquatour, as it were, for their Horizon. These Periscipare of two sorts, for some are contained in the Artische circle, the other in the Antarcticke, whereof both are as yet vndiscoured; especially the Antarcticke, being farthest off from our climate.

1 The habitation of the Amphiscij comprehends 7. Parallells, of the Heteroscij 41. of the Periscij 6. Moneths.

Of the nature and accidents of these three forts of people there needes no more to be spoken, then we have delivered before in this Chapter: Neuerthelesse, for a recapitulation of our former doctrine in this and the precedent Chapter, it will not be amisse to insert this Table of Climates, set out by our exactest Geographers; wherein is expressed (as it were) to our view the respect and severall accidents, which belong to these severall inhabitants.

ly considered: The inhabitants absolutely considered: The inhabitants compared one with the other according to their position, are the *Periaci*, *Antaci*, and *Antipodes*.

14 The Perioci are those inhabitants which dwell in the two opposite points of the

Parallell circle.

15 The Antæci are fuch as dwell under the fame Meridian, but in divers Parallels æqual-

ly distant from the Æquatour.

one Meridian, but vnder two Parallels æquidistant from the Æquatour, and two opposite points of those Parallels. These

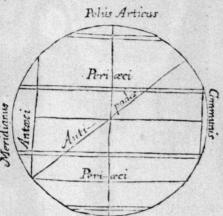
ATable of the Climates belonging to the three fores of Inhabitants: Pag: 229.

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GEAGRAPHIE. The first Booke.

ارد. آد. These names being originally Greeke are taken from the diverse manner of dwelling of one nation in respect of another. The Periaci are called such as dwell (as it were) about the Hemispheare in the same Parallell in two opposite points: the one in regard of the other being Easterne, the other Westerne: so that they are supposed to differ the one fro the other 180 de-

grees which is the femicircle: where we are to note, that thefe degrees are to be nubred, not in a greater but a leffer Parallell, which is leffe then the Æquator. For they which are vnder the Equatour it felfe in 2 op pofite points



Polis Antarticus

are to be accounted rather Antipodes, although (for ought I fee) the name might agree. The Antwes (as the name imports) are such as dwell one against another, having one selfe-same Merid an and equall distance from the Equatour, the one in the Northerne, the other in the Southerne Hemispheare. The Antipodes (otherwise called Antichthones) may popularly be described to be such as dwel feet to feet one against the other; so that a right line being drawne from one side to the other, will passe by the Center of the worlds whence they precisely are distant the one from the other 1800 in a greater circles wherein they are distant the one from the other 1800 in a greater circles wherein they are distant should be suffered from the Pericesi, which are divided by the degree, of a lesser circle such compared one to the other are the Imericans and the Easterne Indians about the river Ganges; the Inhabitants of Peru and Caleente; those of Peria &

Summatra to England I finde no other Antipodes but the Sea, or at least some parcell of land in the South continent neere Pfittacorum Regio: Here is to be noted that the former definitio of Antipodes given by the ancients, was only to be underflood of the knowne habitable part of the Earth; because such as dwell directly under the Aguatour, or either of the Pol s, although they may be Antipodes agree not to that definition: by reason the former are Antipodes only in opposite points of the Equatour: the other of the Meridian. Whether there were any Antipodes or no, was made a question amongst the Ancients,insomuch that Saint Augustine in his booke de cruitate Det, and Lastantine in his third booke of Institutions, seemes stiffely to defend the contrary : which opinion is supposed to growe out of their contempt or neglect of Mathematical ftudies, in those ages wherein the zeale to religion was most vnnecessarily opposed to Philosophie, and the mistresse forsaken of her best hand-maides: which ignorance of the Ancients was fo far deriued to posterity, that in the yeare of our Sauior 745 one Boniface Bishop of Mens, was accused before Pope Zachary Virgilius Bishop of Salisburg, for herefie, in that he averred there were Antipodes: The matter being first preferred to the King of Bohemia, and an appeale made voto the Pope, it happened that the honest Bishop for this affertion, was flatly condemned for hæreticall doctrine, and inforced to recant his opinion: yet is it wonderfull how fuch matters were thus decided: for granting these two easie grounds, First that the earth is Sphericall, a proposition proued in their time; 2 That enery place, or at least two opposite places in the Terrestrial Spheare may be habitable; it must of necessity follow, that such Antipodes must be granted; which makes me to imagine that Saint Augustine absolutely and groffely denied not the Antipodes; because in setting downe the premisses and grounds of our o. pinion, he seemed to vinderstand them too well to deny a neceffary induction, being a man of fo great a wit and apprehenfion: but questionlesse he thought that the Torrid Zone, which by most of the Ancients in his time, was reputed vnhabitable and vnpassable, no man had yet set his foot in those remote

parts beyond the line: fo that it feemed in him not to arise out efignorance of the confliction of the earthly Globe; but out of the receased opinion of the Torrid Zone, and the vast Ocean; the one of which he held vnhabitable, the other vnpaffable: from whence also sprang v, an argument, or rather an idle fancie, that the Antipodes could not be admitted without granting another Saviour, and another kinde of men befides Adams posterity: for if this coniecture had not taken place, the Pope (l'suppose) would neuer have proued himselse so ridiculous a Indec, as to have condemned Virgilius for harefie. As for La-Chancins (nowfocuer otherwise a pious eloquent Father) the weaknesse and child shnesse of his arguments, will to any indifferent reader d scouer his ignorance in the very first rudi. ments of Cosmegraphic. Here we may learne how farre religionit felfe is wronged by fuch who fet her opposite to all her servants. But whatsocuer the Ancients out of their glimring reason have coniectured, our times have sufficiently decided this controverse; wherein such Antipodes are established both by reason and experience: which matter we shall reserve to our second booke; wherein we shall declare how farre, and in what fense the Earth may be tearmed habitable.

Those which are to vs Perioci, are the Antoci to our Antipodes: our Antoci the Perioci to our Antipodes: likewise our Perioci are the Antipodes to our Antoci.

This Proposition as a Corollary may by necessary consequence be deduced out of the precedent definition, and be well expressed out of the constitution of the artificial Globe, and needs no farther demonstration.

2 The Perioci, Antoci, and Antipodes are diverfly distinguished in respect of the cale-stiall apparences.

The proprieties of the Periaei are chiefly foure. I They have the same elevation of the Pole, and therefore the same temper

of the years, and the fame length of daies and nights. 2 They dwell East and West in regard one of the other, 2 They have contrary times of daies and mights; for when the one hath his Noone, the other injoyes his mid-night: hkewife when the fun with the one rifeth, it ferteth with the other. 4 They have the fame Zone, Climate, and Parallell; but differ by a semicircle, to wit, 180 degrees. To the Antaci they have likewife affened rproprieties. viz. I They inhabite the like Zones, but in diverse Hemispheares. 2 They have the same elevation of the Pole, but not of the same Pole; because the one sees the Pole Artlick the other the Pole Antartlick aqually railed about his Horizon, 3 They have Noone and Mid-night iust at the fame times. 4 They injoy the same temper of the Heauens. 5 They have the seasons of the yeare contrary. For when the Southerne Antaci haue their Summer, the Northerne haue their winter; and contrariwife: when the Northerne, have their Spring, these have their Autumne. To the Antipodes they have allotted 3 Proprieties. 1 That they have the fame elevation of the Pole, though not of the fame Pole. 2 They haue the same temper of the yeare, and the same quantity of dates and nights. 3 They have all the other accidents contrary: For when the one hath Night the other hath Day, when one Winter, the other Summer; when the one the Spring, the other Autumne; and contrariwife. These accidents and proprieries here mentioned, must be understood in respect of the Heavens only. The qualities arising from diverse other Accidentall and particular causes in diverse places of the Earth, we shall differre vnto our second part.

CHAP. 11.

CHAP. XI.

Of the Longitudes and Latitudes.

The distinction of the Terrestriall Globe according to certaine Spaces, being formerly explaned, wee are now to treat of the Distinction of the said Spheare according to certaine Distances.

2 A Distance here we understand to be a direct line drawne betwixt two points in the Earth: such a Distance is twofold, either

Simple or Comparative.

3 The Simple Distance is taken from the two great circles: to vvit, the Meridian, or the Æquatour: which is either the Longitude or Latitude.

The division of Distances into the Simple or Comparative, is most necessary: for it is one thing for a place absolutely taken in it selse, to bee distant from some fixt point or other in the Globe: Another for two places to be compared betwixt them selves in regard of such a fixt point: for assuch as the former implies only the distance betwixt two points, the other the distance of two such points or places in respect of the third. These points, from which such to oints are said to be distant, are either found in the Meridian Circle, from which the Distance is called Longitude; or else in the Equatour, whence wee call it Latitude.

4 TheLongitude is the distance of any place Eastward from the first Meridian.

To understand the better the Longitude, we must consider that it may be taken two waies: either Generally, or Specially : In the former sense it is taken for the Distance of the whole Earth. stretched from the West vnto the East, and contrariwise from East to West. The bounds or limits of this Longitude were by Ptolomie and the aucient Cos nographers for no farther difant then the halfe circle, containing 180 degrees; because the reft of the Earth lay at that time vndifcourred. The end of this force towards the East, was the kingdome of China, at the fartheft part of all India, diftant, as wee faid, from the Fortunate Ilands where 'I tolomie placed the first Meridian, 180 degrees: which being taken in the Meridian, and refolued into Miles, according to our former rules, will give 10800 Italian miles: but this space delineated out by the Ancients, was very scant and narrow in respect of the other parts since found out, being added to the former. For beyond the bound fet by Prolomie in the East, it is manifest that 60 degrees are found out and made knowne. An example whereof we have in Sorthia without the mountaine Eman, which is knowne to extend it felfe 60 degrees East ward towards the kingdome of Cathay, disco. vered by the Portugalls: fo that the breadth of the Earth Eaftward is fully knowne to far as 240 degrees, which being meafured in the Aguatour will amount vnto 14 00 miles. Moreouer towards the West, beyond the Fortunate Ilands, it is knowne to fretch to the farthest border of America: 10 that 340 decrees of the earth is fully detected, if not all the rest being only 20 degrees, which are only deficient to make up the whole circle. Which we may the sooner credit; because our times have brought forth (for ought any Authors have related) the most excellent Nauigators of all ages, which have sailed the vast Globe of the Earth round about, and lest behinde them a foundation whereon others might eafily build. But to let paffe the Generall Longitude of the Earth betwixt the East and the West; Wee must vinderstand that the Longitude here mentioned

mentioned is to be taken in a more special sense, for the Distance of any place from the sinft Meridian, being placed either in the Canarics, as the Ancients would have it, or in one of the Azeres according to the latter Geographers. This then must be the bound from whence we must beginne our account; The subject wherein the number of degrees may be taken, may bee the Æquatour or Parallell. Whence by some the Longitude of a place is defined to be an Arch of the Æquatour or Parallell intercepted betwixt the first Meridian and the vertical point of the place proposed so that by necessary consequence, such places as are subject to the same Meridian, in the same Hemispheare, Easterne or Westerne, hauethe same Longitude, which is the distance from the point of the West; but places declaining more towards the East haue the greater Lognitude; but neeser to the West, lesse.

I Places inioying the same Longitude are not alwaies aqually distant from the first Meridian: and contrarywise places aquidistant from the first Meridian hauenot alwaies the

same Longitude.

The reason is evident out of that which hat's beene often spoken before: 'ceause the degree, esta greater circle are greater, of a lesser lesse, according to the greatnesse of the circle. Now the Longitude of a place measured in the Æquatour, will answere to 60 Italian miles: but in other Parallells lesse.

2 The difference of Longitudes begets the difference of Times. Those therefore which exactly are subject to the same Longitude, have their Noone at the same moment: but where the Longitudes are different, the Noonetides are also different.

That the difference of time is varied according to the diffesence of Longitude in diverte parts of the Earth, is a matter obuious to every mans understanding out of two premised grounds. I That the Earth is Sphæricail. 2 That the Sunne in his Diurnall courf: once in 24 houres compass th it round: whence it comes to paffe that places fituate Eastward, fee the Sunne sooner then those which are placed in the West, & that with a proportionall difference of time, that to every houre in the Sunnes motion is affigued a certaine number of correspondent miles; which is in some sort expressed in a Geographicall Globe or Map, wherein we shall finde described 12 Meridians, which duide the whole compafe of the earthly Spheare into 24 aquall parts; in such fort that betwirt each of the two neerest Meridians, are reckned is degrees, which make one houre: by which we may more eafily understand how soone the No ne-time happens in ene Citty before another: for if one Cirty stands Eastward from another the space of three of those foresaid Meridians, it is evident that it will imoy noone three houres before the other. The reason of this difference of times, is the difference of Longitudes, wherein to every hour. the Cosmographers have allotted 15 degrees in the Sunnes Diurnall motion: so that 15 degrees multiplied by 24 houres, which is the whole naturall day, there will be produced 360 which is the number of degrees in the whole circle.

3 If two men from the same place travell, the one Eastward, the other Westvard round about the Earth, and meet in the same place againe: they shall finde that hee which hath gone Eastward hath gotten, and the other going Westward hath lost a day in their account

This is without difficulty to be vnderstood, out of the change of Longitudes, seconded by their travell, varying perperually the quantity of the day: for it is manifest, that he who from any place affigued saileth Fastward mouing continually against the

the motion of the Sunne, will shorten somewhat of his day : taking away fo much from it, as his journey in proportion of diffance, hath opposed and anticipated in the time the Diurnall course of the Sun: so that daily gaining something from the length of the day, which must be elsewhere recompenced. It must needes be, that in the whole circute of the earth, it will amount to 24. houres, correspondent to the whole circuite of the Sunne, and the compasse of the earth, which will make another day: Likewife, if we suppose another in compaffing about the earth, to goe Weltward, it cannot be otherwise imagined, but that seconding the course of the Sun, by his owne journey; he will daily adde fomewhat to the length of his day, answerable to his distance, from the place wherein he began to follow the Sunne in his course from East to West. The daily addition to the length of the day, propottionall to the longitudes which he changeth, (the Sunne running a like courte) must daily diminish somewhat of the Diurnall course of the Sunne, and so at his journeys end, which was supposed to be the whole circuite of the earth, answerable to 24. houres in the Sunnes course, it will loofe a whole day, To demonstrate both these cases, we will imagine in supposition, that of these two trauailers going the one Eastward, the other Westward, the former should take away from the length of the day, or the latter adde to it for eucry 15. miles one minute. Then by the golden Rule, if 15. miles either fubtract or adde one minute in the length of the day, must 21600. miles, which is the whole compasse of the earth, according to the same proportion, either subtract oradde 1440 minutes. which make 24. houres, the length of the naturall day. To confirme the demonstration by popular experience, I remember I have read in the Hollanders discourry of Fretum de Mayre, that comming home into their owne Countrey, they found by comparing their accounts with their countreymens at home, they had lost one day, hausing gone Westward, & so compassed the earth round. Hence will arise divers. confectaries not unpleafing to be scann'd. One I will touch. not much dissonant from our purpose; That three men residing

in the same place at one time, shall not with standing all vary one from the other in the dayes of the weeke, keeping yet an exact account : which to explaine the better, we will suppose a lem, a Sarazen, and a Christian, refiding in the fame towne together: It may to happen according to our former grounds, that the Sarazen according to the Law of Mahomet, shall observe his Friday, the Iew his Saturday, being his Sabboth; and the Christian the Lords day, being the Sunday; yet so, as all shall happen on the same day; all of them excluding any errour in their calculation. For supposition fake, we will place them all at one time all together in Palestine on a Saturday; at which time, let vs imagine the Sarazen to take his journey Westward, the Christian Eastward, so as both of them in their coasts compasse the world, to meet againe in the same place: The lew all the while we suppose resident in the same place: it will follow by necessary consequence, that the Sarazen going about the earth Eastward, will loofe one day; the Chriftian journeying Westward, will gaine one day: the low remaining in the same place, will neither gaine nor loofe. These three men then, meeting together againe after a yeare, two, or three, at the same place, must needes make a divers account; for one and the selfe-lame day, will be to the Sarazen Friday, to the Iew Saturday, and to the Christian Sunday, if they exactly calculate the time from their first meeting, to their returne vnto the same place. Me thinkes this, if there wanted other Arguments, were a reason sufficient to convince some Brait-laced men, who rigidly contend our Lords day (which they erroniously tearme the Sabboth) to be meerely morall, as grounded on the Law of nature. It it were fo, according to our premises before demonstrated, this absurditie would enfue necessarily: That the Morall Law, which they call also in a fort the Law of nature, is subject to manifold mutation, which by our best Divines is veterly denied. The consequence will eafily follow, because it cannot be denied by any Christian. but that all nations of the world iffued from Noahs Arke, the Seminary of mankinde, and spread themselves from thence ouer the face of the whole earth, some farther, some at a shor-

cer diffance: whereby changing the longitude with their habitation, they must of necessity alter the differences of times, whereon they teeke to ground their Sabboth. Neither at this day can any min exactly and precifely observe any one day, either as it was first appointed by Moses in the Lenisicall Law, or as it was instituted by Christs Apostles afterwards; by reafon of the manifold transportation of colonies, and transmigration of Nations from one Region into another, whereby the times must necessarily be supposed to vary. And if any more moderate should vrge, that not the exact scuenth day from the first institution, bound vs to observation; so one day in feuen be observed: it can hardly passe without exception, forafmuch as if any man , as Magellane, Drake, or Candift, should trauaile the world about, a day must needes be varied, as we have thewed. Here I would willingly demand, who ther fuch travailers returning home into their owne countries, should celebrate the same Lords day according to the institution of their owne Church; or elfe as they finde according to their owne account: If they observe the latter, they must schismatically divide themselves from the Church, and keepe a Sabboth of their owne, which in every mans judgement would be thought abfurd, as the mother of many inconveniences: If the former take place, then must the day be changeable in his nature, and fo one day of feuen of them should not be obferued. I speake not this to cherish any neglect of the duty we owe that day, but rather to proue it not meerely to be grounded on the Law of Nature, as Ome would perswade; but rather an Ecclesiasticall constitution, derived (as it seemes most probable) from the Apostles, though not in practice in Christs time, wherein the Iem fb Sabboth was not yet abolished: But I have dwelt too long on this, and may perhaps incurre sharpe censure; for wading too farre into the depth of Divinity: But my Apology shall be this, that albeit I have gone beyond my present subject, I have not yet transcended the limits of my profession: I serue no faction, and therefore dare aduenture my language as free as my opinion.

5 Concerning the longitude, two things are to be knowne, 1. The Invention. 2. The Expression. The Invention proposeth vs the way and maner of the first finding out of the longitude of places.

There are few things in nature which have more perplexed the wits of ingenious Mathematicians, then the exactest way of finding out the longitude of places: Not that the matter was ouer difficult in it selfe, but that they fought out a way to performe this conclusion, not depending from the observation of the celestiall bodies and motions; a matter as yet neuer found out, and I feare me vnpossible: Because they proposed to themselues one of these two wayes to finde it out; either by fome magneticall instrument, or else by industry of nauigation meither of which can much profit. Not the former, because there have never beene any fixed points found in the Aguator, betwixt East and West, as betwixt North and South have beene observed: so that nothing can proceed out of the meere nature of the earthly Globe, whereon we may ground any difference of longitude: Neither is the second very beneficiall, for that all voiages both by Sea & land, are very irregular and vncertaine; either by reason of fundry impediments, as rockes, mountaines, woods, contrary winds, and other dangers turning afide the direct course of passengers from any direct way, or observation, or else by the Ignorance of Mariners, which feldome paffe to farre on discouery: and if they doc, know not perfectly to delineate out their journey, as a Cosmographer would expect, to any rollerable satisfaction. Neuerthelesse, by Astronomical observation, we have many wayes left vs for the performance of this conclusion, as shall be taught in these following propositions.

1 By an Eclipse of the Moone, the longitude

may be found.

This conclusion is in this fort to be performed: First, it behooueth you to know, as you may by an Ephemerides, at what houre an Eclipfe shall happen at som: knowne place, whereof you are well informed of the longitude: Then must be obferued by an Aftrolabe, or other Aftronomicall inftrument. at what houre this Ecclipfe begins at that place, whereof you would willingly know the longitude: If the Ecclipse do begin in both places the felfe-same time, you may affure your felfe that thele two places differ not in longitudes But if there be a difference in the time, then must there be a difference in the longitude, which to finde out, you may in this fort proceed: Take the leffer fumme of houres out of the greater, and there will be remaining, either houres or minutes, or both: If there remaine houres, then multiplie the fame by 15; if minutes, diuide the same by 4; (for in this account as we have taught, 15. Degrees make an houre) and adde the difference fo found vnto the longitude, if the Ecclipse appeare there sooner: but if later, subtract it from the longitude formerlie knowne. If there remaine any minutes after the diution, you must multiply those minutes by 15; and so shall ye have the Minutes of Degrees. To explaine this the better, we will take this familiar example fro some of our later writers. The longitude of Paris was fet downe by Ptolomy, to be 23 degrees; now we may be informed by an Ephemerides, that a certaine Eclipse of the Moone beginnes there 3 houres after midnight; out of this I would willingly learne the longitude of Tubing a towne in Suenia: In this towne I observe by some Astronomicall infrument, at what houre the Eclipse there beginnes, which I finde to be at three of the clocke and 24 minutes after midnight. Then by the subtraction of the effer number of time out of the greater, I finde the remainder to be 24 minutes, which divided by 4. which makes one degree, the quotient will be 6. degrees : and that is the difference, which if you adde to the knowne longitude of Paris (because the Ecclipse begins there sooner then at Paris) t wil amount to 29 degrees: wherby we may collect that the longitude of Tubing is 29. degrees. To this rule for the most part are squared all Cosmographical Tables Ee

Tables of longitude, but yet in this happen divers errours:

1. Because oftentimes in the Artisteet there wants diligence in observing the right houre and moment of the Eclipse.

2. The divers Epacts and latitudes of the Moone are commonlie neglected; wherefore some have thought it the best way (if it were to be hoped) that divers exact Astronomers should at divers places observe the same Eclipse, & so by conferring together according to the former Rule, finde out the longitudes of those places. But exact Astronomers cannot be so easilie found in every citie, where sweepenot alwaies such correspondencie in friendship; neither is an Eclipse of the Moone alwaies at command. Neverthelesse, this way is not to be despised, because where better waies are wanting, we must content our selves with what we finde.

2 By a Clocke, Watch, or Houre-glasse, to finde

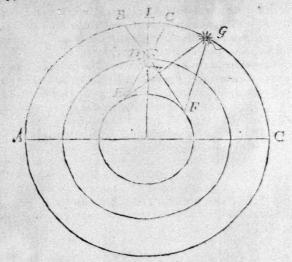
out the longitude of aplace.

This conclusion is to be performed in this manner; You must get you a watch or clocke, apt to runne (if you can)24 houres; this watch must you, by the helpe of an Astrolabe, rectifie and fet iust at such time as you depart from the place where you are, as bound to any other place, whereof you defire to inquire the longitude: during which time, your diligent care must be to preserue your watch in motion without intermission: being at last arrived at the place whereof you inquire the longitude, you were best to stay till such time as the Index shall precisely point out some perfect houre : At the same inflant it must be knowne by an Aftrolabe, what houre it is at the place where you are arrived; for if your Astrolabe and Wasch should both agree in on: you might affure your selfe that there is no difference of longitude betwirt the place whence you came, and the place whereto you are arrived: For it is evident that in this fort your journey bath beene either directly North or directly South under the same Meridian. But if this differ either in houres or minutes, they must be reduced vnto degrees in such fort as we have showed in the former way. Through which

which you may finde out the Longitude which you defire to know: This Invention is by our Country man Blundevill aicribed to Gemma Frisius; although I should take it to be more ancient: but whose Invention soeuer it was, certainely it cannot but commend the Author. Peter Martyr in his Decades, feemes to preferre this way before all the reft; neuertheleffe in this I cannot affent to his opinion, being one I had rather truth as an Hiltorian, then as a Indicious Cofinographer; because the way cannot but admit of great vincertaintie: infomuch as a Wirch or Clock will move in equally, being corrupted with rull, effecially on the Sea, which alwaies abounds with moift vapours: wherefore on the Sea, some haue thought an Houreglaffe more convenient, which is true in comparison of the Watch; but neither will the fands of an houre-glaffe keepe alwaies the like motion: If any certainty may bee this way, it must be by the helpe of the Automaton or perpetuall incueable, of whose invention we may sooner despaire then of finding out this conclusion.

> By the distance betwixt the Moone & some knowne Starre, which is situate neere the Eclipticke, the Longitude may be found out.

This way was raught by Appian, illustrated by Gemma Frifin and Blundevill, to whose manner of explication, wee have for farther illustration added a Figure of the Parallax whereon this Invention is grounded. Full then to flew this conclufron, we must first lay this ground: that the Distances betwixe the Moone & other stars in the firmament are varied according to the difference of places: Infomuch as two men living farre distant in divers places of the earth, beholding at one time the Moone and some other knowne fixt starre, will not finde the like diffince betwist them : whereof if any man doubt, he may be informed by this figure. We will imagine O to be the place of the Moone, as seated in the lower Orbe; G to be the place of the fixt starre, whose distance from the Moone is inquired: E and F two stations or habitations of men dwelling on the earth, whereof we may imagine the one to be in Europe, the Ec 2 other



other in America: It will be manifest that the inhabitant fitte ate in F will behold the Moone in the point B; and the faid fixt starre in G: (because as the Optickes reach vs', all things are feene in the places opposite to the eye) so that the distance betwixt the Moone and the faid ftarre, will be the Arch of the greatest Circle B G of the other fide: the inhabitants fituate in E, will behold the Moone by the ray E C in C: as likewife the faid fixt starre G in the point G, by the ray E G: fo that the distance betwixt the Moone and the fixt starre, will be in that station the Arch of the circle C G. Now by the first common Axione of Euclide, every man must grant that the Arch of B G is greater then C G, the former being the whole, and this the part. Secondly, out of the same ground, wee may as eafily collect that this distance betwixe the Moone and some other knowne fixt starre is varied proportionallie, according to the diffances of the places on the earth, because so many places as there are, so many diuerfitie

uerfitie of aspects will arise, being increased or diminished, according to the distances of places on the Terrestriali Globe: This conclusion thus demonstrated, we must proceed to praetice in this manner, as is taught by Gemma Frisius: First, it behooveth you to fearch out by the helpe of Aftronomicall Tables, the true motion of the Moone, according to the Longitude, at that time of your observation at some certaine place, for whose Meridian the rootes of those Tables are calculated. 2. You must know the Degree of Longitude of some fixed starre, nigh vnto the Eclipticke, either preceding or following the mooning of the Moone. 7. You must feeke out the Distance of mooning of the Moone, and the faid starre. 4. The distance once had, apply the crosse-staffe to your fight, and so mooue the Crosse to and fro, till you may behold the Center of the Moone, at the one ende, and the fixed flarre with the other. So shall you see expressed by the Degrees and Minutes marked on the staffe the distance of the Moone and the said starre correspondent to the place of your observation; which being noted, fer downe also the distance betwixt the Moone and the foresaid Starre which was first calculated. Then subtract the lesser from the greater, the refidue will shew the least difference : which being duided by the mooning which the Moon maketh in one house you shall knowe the time in which the Moone is or was joyned with the first distance of the foresaid starre. Then having converted that time into degrees and minuts, the rell will be performed either by addition or substraction of the Product thereof to or from that Medidian for which the Tables where by you first calculated the motion of the Moone, were appointed and verified. If the diffance betwixt the Moone and the fixt Starre of your observation be leffer, then must you adde the degrees and minutes to the knowne Latitude, fo shall you finde the place of your observation to be more Eastward. If it be greater, then substract the degrees and minutes from the knowne Longitude, and the place of your observation in this regard will be more Westward. These rules are so farre true that the Moone be supposed to bee more Westward then the fixt

fixed Starte: for if otherwise, your working must be cleane co. trary: to wit, if the distance betwixt the Moone and the fixed Starre be leffer, you must subtract the degrees and minutes from the knowne Longitude: fo thall the place of your observation be more Weltward: but if it be greater, then must you adde the degrees and minutes viro the knowne Long ande, & the place of your observation shall be found Eastward. This way, though more difficult, may feeme better then all the reft; foralmuch as an Eclipse of the Moone seldome happens, and a watch, clock, or houreglaffe cannot fo well be preferred, or at least so well observed in so long a voiage: whereas every night may feeme to give occasion to this experiment ; if so bee the ayre be freed from clowds, and the Moone shew her face about the Horizon.

4 By the observation of the difference in the Sunnes and Moones motion, the Longitude of .

places may be found out.

To explane this proposition, we will fet downe three things. I Certaine Postulata, or granted Axioms. 2 The example. 2 The manner & practife: The grounds or propositions which we take as granted of all Mathematicians are thefe. I That the motion of the Moone is 48 minutes of an houre flower in 24 houres, or 360 degrees, then that of the Sunne. 2 That by obfervation of the heavens, and other Mathematicall helpes, an Artificer may know in any place first the Meridian: Secondly the houre of the day: Thirdly the time of the Moones comming to the Meridian. 3 The time of the Moones comming to the Meridian may be knowne by an Ephimerides: These things granted, wee will suppose for example, that in London the Moone on some set day comes to the Meridian at source of the Clocke after Noone: 2 That in some part of the West Indies, the Moone be observed to come to the Meridian the same day at 10 minutes after foure. These grounds thus set downe, the distance of Longitude of that place Westward from London may be found out. The manner of practife is thus to bee wrought

wrought by the golden Rule. If the difference of the Sunne & Moones motion be 48 minutes of an houre in 360 degrees, what will it be in 10 minutes? The fourth proportionall number will be 75 degrees, the distance of Longitude of the place affigured from London, in West Longitude, from which number the Longitude from London being fabera oled, and the remainder from 20, the refidue will thew the Longitude. If the Moone in the place affigued come fooner to the Meridian, we n uft count fo much in East Latitude. This way I first found in M. Purchashis relation of Halls discovery of Groenland, written by William Baffin fince this Chapter came under the Presse: the expression of which, being as I suppose shorter and easier then in the Author, I doe owe for the most part to my worthy Chamberfellow, M' Nathanael Norrington, to whole learned conference, I confesse my selfe to owe some fruits of my labours in this kinde, and all the offices of friendship. This manner of inuention, for mine owne part, I preferre before all the rest, both for certainty and facility: and (as it should seeme by Baffins practife) it is more in vie amongst Marriners then the former, how focuer lefle mentioned amongst writers.

14 Thus much for the Invention of the Longitude: the Expression is the imitation of the Longitude on the face of an Artificiall Globe or Mapp; which is directed by these Rules.

I The place whereof we desire to knowe the Longitude being brought to the Brasen. Meridian, the degrees of the Æquatour will shew the Longitude.

This Rule may easily be explaned by these three precepts. First that you must turne round the Globe on his Axell-tree, till you bring the place where seek the Longitude under the brasen Meridian. 2 You must diligently and exactly marke what degrees

degree the Meridian cuts in the Æquatour. 3 You must number how many degrees that point is distant from the first Meridian, and the number will give you the true Longitude sought after. This also may be performed without turning of the Globe, if so be any other Meridian in the Globe signed out shall passe by the said place. For this Meridian will cut the Æquatour in some degree or other, which being numbred, as before from the first Meridian, will shew the direct Longitude: the like of which we have in the second case.

2 The Meridian running through any place of the Geographicall Table, will point and defigne out in the Æquatour the degrees of

Longitude.

This may easily be taught by the former way performed on the Globe: as for example, if I should inquire the Longitude of Paris the Metropolis of France, in a Geographicall Mapp, I finde a Meridian markt out which runs, if not directly through yet very neere the said City. This Meridian I trace along to the Southerne part, till I finde it to meet and cut the Equatour. Then observe I in what degree of the Equatour it makes his intersection, and I finde it to be 23 degrees 20 minutes, which is the Longitude of the place.

titude comes in the next place to be handled: the Latitude is the Distance of any place from the Equatour, either North or

South.

What we have spoken of the Longitude must also agree to the Latitude, that it is taken sometimes absolutely, and generally sometimes specially: in the former sense it signifies any distance or space between North and South, or contrariwise from South to North. Amongst the Ancients was the breadth or Latitude held to be about 80 degrees, so that the vimost bound

bound or limit to it Northward was called Thule, which commonly is supposed to bee Island. But the latter Navigators through their diligence have detected to much land that it is found to stretch beyond 81 degrees toward the North, and as toward the South, and much farther if we will beleeve the relation of Ferdinand de Quir, a Spaniard, who boafts a more ample discouery of the South Indies, then ever before hath beene knowne. But howfoeuer, the Latitude here defined is taken in a more speciall and stricter sense for the distance of any place from the zquinoctiall line, be it either toward the North or the South. The bound therefore from which we begin our account of Letitude is the Equatour; but the subject wherein it is meatured is the Meridian: fo that it is cleane opposite to the Longitude, for that was limited by the Meridian, and meafured in the Aguatour. The Latitude of a place is alwaies zquall to the Elevation of the Pole, as we shall shew hereafter, and is divided into the Northerne and the Southerne Latitude whereof the one is from the Equatour Northward, the other Southward.

16 Concerning the Latitude are to be confidered the *Invention*, and the *Expression*: the Invention is againe twofold, Astronomicall or Magneticall.

17 The Astronomical Invention of the Latitude is by the observation of the Starres, which is directed by these Propositions.

The Meridian Height of the Sunne at the time of the Equinoctiall subtracted from 90 degrees, will show the true Latitude of the place.

The height of the Sunne at Noone may be found by the Afrolabe, Croffe-fraffe, Quadrant, and many other Afronomicall

Ff

Instruments

instruments, but in taking the Meridian Altitude, it is very fit and requifite that it be observed diverse times one after another with some little space betwixt, to trie whether it increaseth or decreafeth; for if it doth increase, then affure your felfe it is not full Noane; if it decrease it is past Noone: having thus found out the Meridian Altitude, you must subduct it from go degrees, and the refidue will bee the true Latitude of the place, if so be it be observed at the time of the Equino Stiall, when the Sunne enters the first point of Aries, or Libra: 35 for example here at Oxford I observe the Meridian height of the Sunne about the IIth of March, and I finde it to be about 37 degrees, or thereabout, which I subtract out of 90, the whole Quadrant, and the refidue will be 51; which is the Latitude of the place. But if you would know the Latitude at any other day, or time of the yeare, then must you proceed in this manners having taken the height of the Sunne at Noone (as before) you must by the Table of Declination learne the true degree of the Sunnes declination. 2 If such declination be Northernly, then must you subtract it from the foresaid Altitude or height. But if Southerly, you must adde it to the Altitude: and by fuch addition and fubrraction, shall you have the height of the aquinoctiall about the Horizon. 3 This height of the Equinoctial about your Horizon, being as before fubtracted from 90, will be the true Latitude of the place affigned: as for example, the 15 of August I observe the Declination of the Sunne to be about 10 Degrees, the Sunne being in 2 Degrees of Virgo: I finde the Meridian neight of the Sunne to be 48 degrees or thereabouts. Now because the Sunne being in Virgo, hath a Northe ne Declination, I subtract 10, which is the number of the declination, out of 48 the height of the Sun, and there will remaine 38, which againe taken out of 90, the refidue will be about 52, the common receased Latitude of the place.

2. The Meridian height of any Starre, the Declination subtracted, if it be Northerne, or added added if it be Southerne, being subtracted out of 90, will she wat any time of the yeare

the Degrees of Latitude.

The former rule ferues only for the day; because it is perly med by the observation of the Sunne, but this latter may bee more necessary for Marriners, who now and then are interced to inquire the Latitude of a place in the night when the Sunne Thines not: wherefore they must flie vnto some knowne Starre by observation of which they may easilie performe the same; according to the rule; which differres nothing at all from that which we speake of the Sunne cut of the Equinoctiall, and therefore need no other exposition then a bare example : let the fixt Starre you beft knowe, be Arcturus, whole Meridian Altitude you finde by your Mathematicall Instrument to be 50 Degrees, and 30 minutes: then shall you learne by some Table that his Declination Northward is 21 degrees, 30 minuts: now because his declination is Northward, you must subtract it out of his Meridian Altitude, and you shall finde the remainder to be 52 Degrees, which is the Latitude for the place: 25 it is commonly taken, although I confesse it might be more exact: being obserued here at Oxford, be found rather et Degrees and 30 minutes.

18 The Magneticall Invention is performed by the Magneticall Inclinatory Needle.

The ground of this Magneticall Invention is from the proportion betwixt the magneticall Inclinatory Needle, and the Latitude of the Earth: for as we have proved in the 13 Proposition of the 3 Chapter; the Magneticall Inclinatory Needle wil at every point of Latitude conforme it felse to certaine Angles with the Axell of the Earth proportionally to the Degrees of that Latitude: vpon which grounds Dr Ridley hath invented a curious instrument to finde out the Latitude for any place assigned, and for this vse hath calculated Tables, which wee hope will bee inlarged by our famous Prosesser.

Mr Briggers for my part, having never seene this Instrument,

or knowne the vie, I cannot enter on the description of it vntill such time as I shall have occasion to acquaint my felse with it.

the artificiall Spheare: which is againe either Astronomicall or Magneticall. The former is performed by the ordinary Globe according to this rule.

The point of any place or Citty first found in the Globe being brought to the brasen Meridian, will shew in the Degrees of the same Meridian the true Latitude of the same

place.

This may eafily be shewed in this manner by an example; If I would willingly find out the Latitude of Oxford in the Globe I first finde out the place in the Globe, which having found, I turne the Globe till I have brought the place iust vnder the brasen Meridian: then I note what degree it designes, and that shewes me the true Latitude of the place, which I finde to bee 52, or thereabouts: but if you would finde it sin a Mappe or Chart, in which there is no such brasen Meridian, you must take the Parallell of the place, or at least the next vnto it, pointed in the same Mappe: Then note what degree the said Parallel curs in the first Meridian; for that will shew the true Latitude of it by the right Parallell of the place, if not the next; so that by addition, or subtraction, you may easily guesse at it.

20 The Magneticall Expression depends from the Application of the Inclinatory Needle to

the Terrella

The Magneticall inclinatory Needle is faid to conforme it felfe in the fame manner to the Terrella or Loadstone, being artifucially therevnto applied, as it doth to the great Globe of the Earth: so that no doubt is, but an imitation of the Latitude

A Table expressing the proportion of the Magnetical Inclination to the degrees of Latitude, and Elevation of the Pole.

Elevat.	[Inclination]	Elevas.	Inclination	Elevat.	Inclination
Pols.	to the Hori-	Pols.	to the Hori-	Poli.	to the Hori-
	zon. 1. 11.		zon. 1.11.		ZON.O.T.11.
1	2 [11]15]	31	1521261301	61	79 28 51
2	4 [10 [13]	72 [521461551	62	801 31 36
3	6 1 26 1551	33 I	54 53 11	63	80137154
4	18 131 1231	34 1	5613 1561	64 1	81110147
_ 5	1 10 33 41	35 1	57 1 1 2 1 25 1	65	181142136
6	1 12 7 23 1501	36- 1	58 121 1191	66	182 1 13 123
7	1 4 1 3 7 1 5 3 1	37 I	59 127 1501	67 1	82 143 19
ŏ	16 27 52	38 1	60 132 1591	68 1	83 111 156
9 1	8 121 1501	39 1	611361461	69 1	83119145
10	20 113 1471	40 1	62 139 10 1	70 1	84 16 137
II	22 13 145 1	41	63 139 156 1	71 1	84 1 32 130
A Revision of the State of the	27 151 1461	42 [641391291		84 1 57 1 24
13	1251571521	43 1	65 [37] 41 [73 1	85 21 22
14 1	37 22 4	44 1	66 [34 [31]	74 1	85 1 44 1 24
15 1	201 41231	45 1	67130101	74 1	86 1 6 131
10	40 1441531	46 1	68 [24] 10]	76 1	86 127 144
17 1	32 [23134]	47 1	6911712 1	77 1	86 48 5
	3410 1271	48 1	7018 1381	78 1	8717 136
And the second second second	35 135 1351	49 1	701581591	79 1	87 126 1 18
20 [37 19 10 1	50 1	71 148 17 1	80 18	7 144 19
21	38 [40] 42 [51 1	73 13510 1	81 1	88 1 10
22	401101411	52 1	73 122 1 381	82 18	88 17 23
23 1	41 1381581	53 17	74 18 13 1.	83 18	38 1 32 149
24.1	43 15 1371	54 1	74153 111	84 18	38 1 47 1 29
25 1	411301261	_55 I	75 135 16 1		89 11 122
	45 153 143 1		76 [16 [5 1]	Contract of the second	89 114130
	4/ [15] 35]		76 157 1281		89 36 54
	48 135 1331		77 1361 591		88 1 38 1 37
STATE OF THE PARTY	49 154 18 1		78 15 23		89 1 391 39
The state of the s	51 11119 1		78 153 1411		961010

A Table expressing the proportion of the Manetical Inclination to the degrees of Latitude, and Elevation of the Pole.

Elevat. Pols.		Elevas. Pols.	Inclination to the Hori- zon. t.11.	Elevat.	to the H
1	12 11 15	31	152 26 1301	61	179 28
2	14 [10 [13]	72	1521461541	62	1801 31
3	6 1 26 155	1 33	1541531711	63	1801371
4	18 131 1231	34	15613 1561	64	1811101
5	1 10 33 41	35	1571131251	65	1811421
6	1 12 1 23 150	36	158 21 197	66	182113
7	1 :41371531	37	159 127 1501	67	1821450

may be expressed on the little earth, or loadstones, for which vie, divers curious instruments have beene devised by magneticall Philosophers, to whom I referre my Readers; because I (as I said) have little acquainted my selfe with the vie of such instruments.

CHAP. XII.

Of the distances of places compared one with another.

of distances, we have treated in the former Chapter: we must in the last place handle it comparatively; that is to say, one place compared with another: whereof we are to consider the Invention and Expression.

The distance is the measured space betwixt two places: which is, either vnisorme, or various; vnisorme is in places different, either in Longitude onely, or in Latitude

onely.

Those places differ in Longitude only, which are situate under the same or like Parallels, but divers Meridians; or at least under op-

posite pointes of the same Meridian.

Of places differing only in Longitude, there may be three cafes: For 1. they may be vider the same Parallell, as the lland of Saint Thomas, and Summaira, which lie directly vider the Equatour; or Novemberg and Hamberg, which having very neare the same Latitude, differ in Longitude, and lie in the same Parallell without the Equatour. 2. They may be vider the like Paralels, that is, in points a quidiffant from the Equatour. As Siene in Egypt, vider the Tropicke of Cancer; and Beach in the South continent, vider the Tropicke of Capricorn.

3. They may be vider the same Parallell and Meridian, but in opposite points of the said Parallell; such as are the Pericci,

4 Places differing only in Longitude, whose distance is here proposed to be sought out, are seated in the same, or divers Hemi-

Spheares.

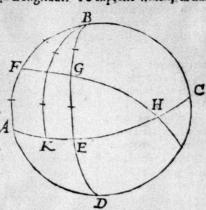
spoken of in the 10. Chapter.

5 In the same Hemistbeare, when both places have either Easterne or Westerne longitude. This agains may have two cases; for either the places are under the Equatour, or without it: in both which, the finding out of the distance shall bee opened in these Rules.

I If two places wnder the Equatour in the same Hemispheare, differ in Longitude: let the lesser Longitude bee subtracted from the greater, and the difference converted into Miles, and the distance will be knowne.

As for example, we will suppose of two places, whose diflance is to be sought out, the former to be the Iland of Saint Thomas in Africa, the other the Iland Summatra in the East Indies, both situate directly under the Equator; and therefore differing only in Longitude. To expresse which, in this

figure, let the first Meridian from which the Longitude is to be meafured be A B CD: the place where Saint Thomas 1land is feated. K : and the place of Summatra, E. The A subtracting A K, the Longitude of Saint Thomas Iland being leffer, out of the Longitude of Summatra



A E, the residue K E will shew the distance in degrees: which being multiplied by 60, and so converted into Italian miles, will shew how many miles the said places are distant the one from the other. As in this present example, we finde the Longitude of Saint Thomas Iland to be 32 degrees 20 minutes; of Summatra, to be 131 degrees: The lesser summe subducted from the greater; to wit, 32 pegrees 20 minutes, out of 131; there will remaine 98 degrees 40 minutes; which being against multiplied by 60, will produce 5920 Italian miles, the true distance betwixt the said places.

2 Of two places in the same Hemispheore, situate without the Æquatour; the distance may be knowne two wayes: either by the resolution of the Sphearicall Triangle, or else by tables 256

The former way is performed in this manner: Let the Triangle oftwo zquall fides F B G in the figure before, berefolged; in which the two zquall fides F B, and G B are the complements of zquall Latitudes; to wit, A F, and E G. The Angle F B G is the difference of Longitude, which Angle, whether it be a Right Angle, or Oblique Angle, will eafily be knowne, if by letting a perpendicular line B I from B to I it be pareed into two Triangles FBI and IBG: for because those two Triangles according to the grounds of Geometry are equall; the Arch IG in the Triangle IB G being found our, the Arch allo IF in the Triangle FB I will also be knowne: which being thus demonstrated, we must proceed in this manner, according to the Golden Rule. As the Right angle BIG is to the complement of the Latitude B G, to is I B G the middle difference of Longitude to I G the middle distance : Pitifem in his Trigosometry to this addes another manner of demonstrat on, expreffible by the precedent figure : let the perpendicular I B be continued vnto K, that B K may make a whole Quadrant. Now will the Triangle I H K haue Right Angles at I and K, at I by supposition, at K by his 57 proposition demonstrated in his first booke : because, If a greater circle of the Spheare paffe by the Poles of a greater circle, it will cut it at right Angles, and contrarinife: wherefore the fides IH and KH must be Quadrants : because, as he shewes in his 68 proposition of his first booke; In a Sphericall Triangle having more then one Right Angle, the fides subtending those Right Angles are Quadrants: Finally, because the Arches GH and - H, are the complements of the Arches I G & K E: by the 9 definition of the first book: Foresmuch as of any Arch less then a Quadrant, the complement is that which wants to make it up 90 parts. We may by the help of the 57 proportion of his first booke, seeke out the complement of the third fide GH; which will be the Arch GI: which will shew vs the probleme which we fought, by reduducing

ducing it vato the Table of fines, and Tangentes, exactly fee out by our forenamed Author and others. For an example of this, we may take two famous cities of Germany, November of and Hamberg, which without any fenfible differer ce have the fame Latitude, but differ in Longitude : For the Lorgitude of Novemberg is 3 I degrees 45 minutes : of Hamberg 32 degrees 30 minutes : the difference of Longitude then is o degrees 45 minutes. These things supposed to be knowne, we will imagine Novemberg to be in F, Hamberg in G : and therefore A F. or EG will naue 49 degrees 22 minutes : FB or GB will haue 40 degrees 37 minutes: FBG or AE will haue o degrees 45 minutes : K E o degrees 221 minutes: E H 89 degrees 37! minutes: if we worke by the Table of Sines Tangentes, and Secantes, the knowledge whereof is required to this Probleme. But because the former way may sceme difficult to fuch as are not much acquainted with Trigonome'ry, some haue fet downe aneasier way, depending on the vse of a Table, wherein is calculated the number of miles answering to energy degree of enery Parallell of the Spheare: in which working. we ought to be directed by this Rule: If two places without the Equatour differ in longitude only, subtract the lest roomber out of the greater, and multiply it by the number of miles answerable to a degree of that Parallell, and the product will give the distance. As for example, if you would know the distance betwixt London and Antwerpe, which have in a manner the fame Latitude, but differ in Longitude: I finde them to differ in Longitude by 6 degrees, which number being multiplied by 37 miles answerable to 51 degrees of Latitude, these will arike to 247 miles, and 54 feconds of a mile.

A Table of Miles answerable to one Degree of enery senerall Lasisude.

-1				2			3	3	
5	M	S	,D	M	18-1	D	M	S	
1	54	59	16	57	41	3.	51	26	
2	;9	5 8	17	57	23	3 2	50	5 :	
3	59	55	18	57	4	33	50	15	
4	59	51	15	50	:4	3.4	49	+5	
5	59	4	20	56	23	35	49	9	
6	59	40	21	56	1	36	45	; 2	
7	59	3 3	22	55	38	37	4	5 5	
8	19	25	23	5 5	14	38	47	17	
9	59	16	24	54	49	39	46	;8	
10	59	5	25	54	23	40	45	58	
1 !	58	54	26	53	,6	41	45	17	
1 2	58	41	27	13	18	+2	44	35	
13	58	2	28	5 2	59	43	43	53	
14	58	t3	29	52	29	44	43	10	
15	57	57	30	51	58	45	42	26	

	4		5		6		
DM	S	D	M	S	D	M	S
46 41	41	61	29	5	76	14	31 30 28 27 25 23 21 19 16 14 11 8 5
47 49	5 5	62	28	10	77	13	30
48 49	5 9	63	27	14	78	12	28
49	9 22	64	26	18	79	11	37
50 3	8 4	65	25	2 1	80	10	25
513	7 46	65	24	74	8 1	9	23
52 30	6 56	67	23	27	8 2	8	21
53 3	5 7	68	2 2	29	3 2	7	19
54 3	5 6	69	2 1	0	84	6	6
55 3	4 25	170	20	311	5	,	14
50 3	3 3	71	19	32	86	1	11
573	2 41	72	18	32	187	2	8
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59 3	0 54,	74	16	32	9	1	3
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6 The distance of places differing onely in Longitude in diverse Hemispheares is

found out by this rule.

1 Let the greater Longitude be subtracted from the whole circle, and onto the residue added the lesser Longitude, there will arise the Di-

stance betwixt those places.

As for example, Lifbone in Spaine hath in East Longitude 13 degrees: and Cape de Los Slavos in America, hath in Welt Longitude 334 degrees: to knowe the distance betwixt those places, you must first subduct 334, which is the greater Longitude out of 360 the whole circle, and there will remaine 25 Degrees, to which if wee adde the East Longitude of Listone, which is 13 degrees, it will make 39 degrees, which is the true difference of those Longitudes: which being multiplied by the Number of miles in the Table going before, answerable to the Latitude of the faidplaces (if they differ only in Longitude) ther: will arise the number of miles contained in the Distance.

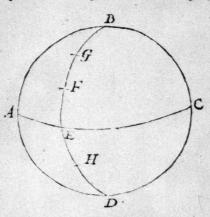
7 Distant places which differ only in Latitude, are such as lye vnder the same Meridian, but diverse Parallells: These are supposed to be either in One, or in Diverse Lati-

tudes or Hemispheares.

8 In One, when both the places hauceither North Latitude, or both South Latitude: The finding out of which distances depends on these Propositions.

I If the Latitude of each place be towards the Same Pole, Subtract the lesser from the greater Latitude, and the residue convert into miles. The reason may be explained in this Figure: wee will imagine

E F to be the leffer, EG the greater Latitude. There will remaine an Arch of the Meridian FG: which being multiplied by 60 (being part of a great circle, wil A make the number of miles answerable to that difface. For an example we will take two C1ties of England. Oxford and Torke.



The Latitude of Oxford, we take to be 51 degrees 30 minutes of Yorke 54 degrees 30 minutes. The lefter Latitude subtracted from the greater, there will remaine three degrees, which being multiplied by 60, will render 180 Italian miles, the Diffance of those two places.

2 If two places in Latitude only distant, be statute in diverse kindes of Latitude: adde the Latitude of the one to the other, and the whole summe shall be the distance.

As for exemple, in the former Diagram, imagining as in the former case BD to be the Meridi in of those distant places, and AC the Equatour: we will suppose the one place to bee situate towards the North Pole, as in G; the other towards the South, as in H: then as appeares by sense, will the distance bee the Arch of the Meridian GH, whereof GE, and EH, are rarts, whereof it is compounded: wherefore it must need s follow that those parts added together make the whole distance: for example we will take Bellograde in Europe, and the Cape of good bope in Africa, which have neere the same Longitude, to

wit,48 degrees 30 minutes: but they differ in Latitude in such fort, as the former hath of the Northerne Latitude 44 degrees 30 Minutes; the other of Southerne Latitude about 35 degrees 30 minutes. These two numbers added together, will make 80 degrees, which being multiplied by 60 will produce 4800 miles the distance of those places.

9 Hitherto of the distances of places which are Vniforme, that is to say, of such as differ either only in Longitude, or only in Latitude: we are next to consider of such distances as are various, wherein the places differ

both in Longitude and Latitude.

be performed two waies, either Abstractively by the resolution of Triangles, or else Mechanically by Instruments. The former againe may be two waies, either by the Right-line Triangle, or by the Spharicall: The invention of the distance by the Right-line Triangle depends on these sollowing Propositions declaring two waies of Invention.

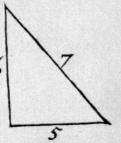
ly considered by it selfe: according to this Theoreme.

I The square Root of the number made of the differences of Longitude and Latitude of two places

places distant, will show the distance of those places.

The ground of this Proposition is taken from the 27 Proposition of the fift booke of Euclide: where it is demonstrated that he square of the Hypotenusa, or greatest side of a Rectangle Triangle is a quall to the two fquares made of the two other fides: which being well vnderstood, will lend an easie light to this proposition. To performe which we must first take the difference of Longitude, which is imagined to make one fide of this Triangle. Then must we observe also the Difference of Latitude, which is supposed to make another side. Then are we fure by the former Proposition of Euclide that the squares of these two sides, are aquall to the square of the Hypotenufe, or third fide; which is to be fought out, and expresses the distance betwixt those places: wherefore we must first multiply these two sides in themselues, whence they will become squires. 2 We must adde them together. 3 We must out of the totall extract the Quadrat root, which will shew the distance: as suppose according to this Figure, two Cities distant and differing both in Longitude and Latitude: whereof the one shall have in Longitude 21 degrees, in Latitude 58: the other is supposed to have in Longitude 26 degrees, in La-

tirude 5 2. Here first I subtract the lesse Longitude out of the greater, to wit, 21 out of 26, and the residue will be 5, which I suppose to be one side of the Rectangle Triangle. Then likewise I subtract the lesse Latitude as 5 2 out of 58, the residue will bee 6, which I make the otherside of my Triangle, which done, I multiply 6 in it selfe, and it makes 36, which is the square of one side: Then I multi-



ply 5 in it selfe, and the Product will be 25, the square on the other side. These two squares added together by the foresaid Proposition must be æquall to the square of the Hypotenense,

or third fide 61, whereof the square root being extracted, will thew the fide it felfe, which will be 7,7 which is the distances If any man defire to knowe this distance according to Miles, he must reduce the degrees of Longitude and Latitude into miles according to our former rules, before he begin to work: because (as we have shewed) the degrees of Longitude being measured in the Parallells are not alwaies aquall, the Parallels being somewhere greater, some where lesser. This way must needs be more exact, in that a Mile is a smaller part then a Degree, and (as Pitiscus notes) the Fractions which fall out in extraction of roots can hardly be reduced to any proportion. Nevertheleffe this way of finding out the distance by a RightlineTriangle, howfoeuer common and receaued, is very vaperfeet and subject to great errour especially in places far distant: foralmuch as it supposeth the Meridians with the Parallells on the Globe to make true squares, whereas indeed all the Meridians meet in the Pole, and so by consequence cannot make true squares: But yet this errour is far lesse in a lesser dittance; because in a small space of earth, the roundnesse and convexity of the Earth is insensible, or at least of very small importance: to that this way cannot be altogether vnulefull.

the former by the Tables of Sines, Tangents, and Secants. This is performed by finding out the numbers: whereof the former is called Inventum primum, or the first found number. The second Inventum Secundum, or the second found number. The working of which Probleme depends on these rules.

1 Multiply the Right Sine of the difference of the longitude into the summe of the complement of the lesser latitude, and divide the produst dust of that multiplication by the totall fumme, and then by the rules of Sines and Tangents the Arch of that Quotient found out will give the first found number.

2 Multiply the right sine of the lesser Latitude by the totall sine, and having divided the product thereof by the sine of the complement of the first number, subtract the Arch of that quotient out of the greater Latitudes which gives the second found number.

Then multiply the sine of the complement of the first found number into the sine of the complement of the second found number, and bauing divided the product by the Totall Sine! Let the Arch of the quotient be sought out by the Tables, which Arch subtracted out of the whole quadrant, will give the degrees of a distance in a great circle.

To expresse the practice and manner of working according to our former Rules, we will suppose the two cities, whose distance is heere sought out to be Ierusalem and Norimberge in Germany. Ierusalem hath in longitude 66. degrees.c.min. and in latitude 31 degrees.40.minutes. Againe Normberge hath in longitude 28. degrees.20. minutes, and in latitude 49 deg. 40. min. The difference of their longitude is 37. deg. 40. minutes. The right sine whereof is 36664: (for here we make 60000: to be the total sine, rejecting the two lass figures on the right hand in the tables of Regimentanes.) Now you must

must multiply 36664: Into the fine of the Complement of the description, which is 51067: the product of which two fines being multiplyed the one by the other, there will a-rise 1872320488: which if you divide by the total fine 60000, the quotient will give you 31205, whose Arch is 31 deg. 20 min.ard this must be your first tound Number.

For the finding of the fecond Number, you must proceede. in this manner : Multiply the right fine of the leffer latitude, which is 21 208 by the totall fine 60000, & the product will be 18898 coop; which fumn e, if we divide by the fine of the Complement of the first-found Number, which is \$1249, we shall finde in the quotient 34876; the Arch whereof is 37 degrees, 55 min: which Arch subtracted out of the greater latitude, there will remaine 11 degrees, 29 min: and thir is our fecond found Number. Thele things thus fupposed to be found out, we must multiply the fore-said fine of the Complement of the first-found Number, which is 58798, and the product will arise to 3013338702, the Arch whereof is 56 deg. 50 min; which being subtracted out of the whole quadrant, viz: 90 degrees, there will remaine 33 degrees, 10 min: of the greater circle. These 33 deg. if we multiply by 60. there will arise 1980 miles , whereunto if we finde the 10 miles answereable to the 10 min. we shall finde the distance betwint these places to be 1990 Italian miles. This example is vied by Appear, and wrought according to his own Tables. and farther explained by our countriman Blundewill in his Exercifes. The same way of working hath bin delivered by Clanim, lundinu, and others, although not according to the fame Tables. This way of measuring the distance by the Sines and Tangents according to these authors, may be warranted more exact than the other, because it admits of smaller parts in the calculation; yet will it come far short of truth.

ces of places, differing both in longitude and latitude, is by the Resolution of a Sphæricall Triangle.

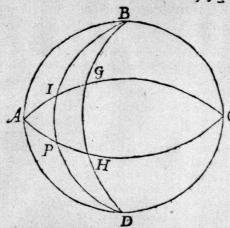
This way of all the rest must needes be most certaine; forasimuch as this kind of Triangle best expresseth the sections of the Globe. The methode of which working I finde nowhere better taught then in Pitifem his Trigonometry : of whose ingenious industry notwithstanding litle vie can bee made, except the Learner first acquaint himselfe with his principlee, because in his Geographical Problemes, he briefely referres his Reader to his former grounds and Axiomes, accurately demonstrated in his former bookes: For mine owner part it might perhaps seeme aa absurd in this Treatise, to inter.nixe all his praparatory demonstrations, being meerely Geometricall, and without the limites of my subject, as by leauing out so necessary a way to mangle my discourse. Wherefore intending a middle way, I will (Godwilling) in fuch fort let downe these propositions, that I may give some light to this excellent Invention, and referre my Reader to Pitifem his Axiomes for farther Demonstration.

by Sphæricall Triangles, admit of two cases: 1 When two places are so situate, that the one is vnder the Equatour, the other without. 2 Secondly, when both are

without the Æquatour.

ther the difference of longitude betwixt those places is *Equal* to a quadrant, or *Lesse*, or *Greater*. The seuerall wayes of Invention shall be directed by these Rules.

I If the Difference of longitude be Æquall to a quadrant, the Distance will also be a quadrant.



Asfor example in this prefent figure we will imagine the circle ABCD to be the fift Meridian: the places whose distance is fought out A and G: whose Distance A G. wil be a quadrant. For A wilbe a Pole

of a Greater Circle BGD, by the 56 prop. of the 1 of 'Pitifem: wherefore all the Arches drawne from thence to BGD will be quadrants by the same proposition. For a mole samiliar instance we will take the Iland Samatra, which hath inlongitude 131 degrees, but no latitude, being sited vinder the Equatour: and the city Buda the Metropolis of Hungary, which hath in longitude 41 degrees, in latitude 47 degrees; The difference of longitude is 30 degrees: for 41 being subducted out of 131, there will remaine 90, wherefore the diffance betwist those places wilbe 90, which being multiplyed by 60, will produce 5400 Italian miles,

2. If the difference of longitude be lesse then a quadrant as AF: the Triangle AEF here is to be resolved into his parts, according to the 4th Axiome of Pitiscus.

As for example the places whose longitude is heere sought out, shall be A and F. The Triangle here to be known is A E F; whose Resolution depends on our Authors 4th Axiome. For

the Difference of longitude is A B F; because the measure of a Sphericall Triangle being taken in a greatericle, is an Arch of a greatericle, described from the Angular point, and comprehended betwixt the two legges of the Triangle so far as a quadrant, as is taught in the 58 proposition of his first Booke. For a more special linstance we will take two places; whereof the one shall bee the Iland of S. Thomas before mentioned, which hath in longitude 32 degrees and 20 minutes. The other Amsterdam in Holland, which hath in longitude 25 degrees, 30 minutes. The former we imagine in A; the later in F. The Difference of longitude A B F wilbe 5 degrees, 50 minutes the distance sought out must be A F: so working according to the fourth Axiome of Pivisess, we shall find the Arch A F, which is the distance, to be 54 degrees, 19 minutes.

3 If the Difference of longitude be greater then a quadrant, as of the two places F and C, the Triangle to be resolved wilbe F (E,

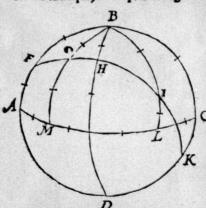
being a Rectangle at E.

Heere because the Triangle FCE hath his two fides F.C. and E C, greater then quadrants, insteed of it you may worke on the Triangle IEF, adjoyned to the Triangle FEC: and the whole worke wilbe dispatched : for by the resolution of the Triangle AEF, you shall find out the Arch FG, which being added to the quadrant CG, there will be produced the Arch F C, which is to be fought out. As for example, we will imagine Heidelberge as it were placed at F, to haue in longitude 30 degrees, 45 minutes, in latitude 49 degrees 35 min: Then we will suppose Summatra, as placed at C, to have in longitude 131 degrees, but no latitude: The difference of longitude will be E C, of 100 degrees, 15 minutes: and the complement A E 79 degrees, 45 minutes. Then working according to the Rules of Trigonometry, we shall find the fine of the Arch FC, to be 6 degrees, 37 1 minutes; which being added to FC, being 90 degrees, will produce 96 degrees, 37 1 minutes, to which Archehere will answer 1449 German miles.

are situate without the Æquatour: This is againe two fold: For either the two places are vnderstood to be situate towards the same Pole, or else one place toward the Northerne, the other towards the Southerne Pole. Both which Cases shalbe taught in these Rules.

i If both places whose distance is sought, be situate towards the same Pole; there will arise a Triangle, whose sides and Angles will bee knowne by the fourth Axiome of Pitiscus in Trigonometry the fourth Booke.

As for example, in this present figure let the two places gi-



uenbee F.G, the Triangle to be knowne, will be FBG, whose acute Angle will be at B. Let the places given be as FH; the Triangle to be resolved & knowne, will be FBH, having a sight Angle at H. Finally, if the places supposed tobe giuen, are as FI, the Triangle to be

knowne will be FBI, with an obtuse Angle at I.

2 If

2 If the one place be situated towards the North-pole, and the other towards the South-pole, there will arise a Triangle, whereof the one side about the Angle which is given, wilbe greater then a quadrant.

As in the former figure, let the places given be as G and K, also H and K, also I and K: There will still fall out a Triangle, whose one side containing the Angle given, with the greater then a quadrant, as B K: wherefore for the side B K, you must take his complement to the Semi-circle B F, that is, for the Triangle G B K, you must worke by the Triangle G B F: and insteed of the Triangle H B K, you must take the Triangle H B F: and for the Triangle I B K, you must worke by the Triangle I B F, according to the fourth Axiome of the fourth booke of Prissing, to which I had rather reserve my Reader, then intermixe our Geographicall discourse with handling the Principles of Geometry, which heere are to be supposed so many pracedent propositions; which, expressed as they ought, would transcend the bounds of my intended journey.

It Of the Abstractive vvay of finding out the Distance of places, vve have spoken: The Mechanicall depends on the vse of Instruments & Mechanicall operation, vvhere-of vvec vvill shevy one vvay in this Theo-

reme.

By the working with a Semi-circle, the Distance of two places may be found out.

This Invention by M. Blundevill, seemes to be ascribed to Edward Wright, yet hath it bin taken up of forreine Writers as their owne, and vsed in their Charts and Mappes. The manner of operation is thus: First, let there be drawne a semi-circle

circle voon a right Diemeter figned out , will be the letters ABCD, whereof D shall be the center, as you find it deciphered in this present figure. The greater this Semi-circle bee made, to much the more case will be the operation; because the digrees wibe la ger. Then this Sem -circle being drawn, and accordingly divided, imagine that by the helpe of it, you defire to find out the diftance betwixt Lon lon and Ierufalem, which cities are knowne to differ both in longitude and latitude. Now, that the true diftance betwixt thele two plac & may be found ou ; you must first subtract the leffer longitude out of the greater, fo shall you finde the Difference of their longitudes, which is 47 degrees. Then reckon that Difference vpon the Semi-circle, beginning at A, and so proceed to B; and at the end of that Difference, make a marke with the letter E. into which point by your Ruler, let a right line be drawne from D the center of the Semi-circle. This being in this fore performed, let the leffer latitude be fought out, which is 32 degrees in the foresaid Semi-circle, beginning your accompt from the point F, and so proceeding towards B, and at the end of the leffer latitude, let another point be marked out with the letter G: from which point let there be drawne a perpendicular, which may fall with right Angles vpon the former line, drawne from D to E; and where it chanceth to fall, there marke out a point with the letter H: This being performed, let the greater latitude, which is 51 degrees, 12 minutes, be fought out in the Semi-circle, beginning to reckon from A towards B, and at the end of that latitude, fet downe another point, figned out by the letter I: from whence let there be drawne another perpendicular line; that may fall with right Angles vpon the Diameter A C, and here marke out a point with the letter K: This done, take with your Compasse the distance betwixt K and H; which distance you must set down vpon the Diameter A C, placing the one foote of your Compasse vpon K, and the other towards the center D, and there marke out a point with the letter L: Then with your compaffe take the shorter perpendicular line GH, and apply that widenesse vpon the longer perpendicular line I K, placing the one

one sort of your compasse 21, which is the bounds of the greater laintade, and extend the other towards K, and there make 2 point at M. Then with your compasse take the distance betwixt L & M, and apply the same to the semi-circle, placing the of e foot of your compasse in A, and the other rowards B, and there marke out a point with the letter N. Now the number of degrees comprehended betwixt A and N, will expresse the true distance of the two places, which will bee found to be 39 degrees: which being multiplyed by 60, and so converted into miles according to our former Rules, will produce 2340, which is the distance of the said places.

17 The expression of the Distance of two places may be performed either by the Globe or Mappe according to these Rules.

I The Distance betwixt two places in the Globe, being observed by the quadrant of Altitude, and applyed to the degrees of the Æquatour, or any great circle, will shew how many miles such places are distant.

The pract se heereof is very easie, as shalbe taught in this example: we will for instance take Tolledo in the middest of Spaine, and the Cape of Good Hope in the South Promontory of all Africa: The space taken by a quadrant of Altitude, or any threed applyed to the Agratour, will be found to be about 22 degrees, which being multiplyed by 60, and so converted into miles, will render 4920, the true distance betwist those two places.

2 The Distance betwixt any two places in the Chart, observed by a compasse, and applyed to the degrees of a greater Circle, will show how many miles such places are distant one from the other.

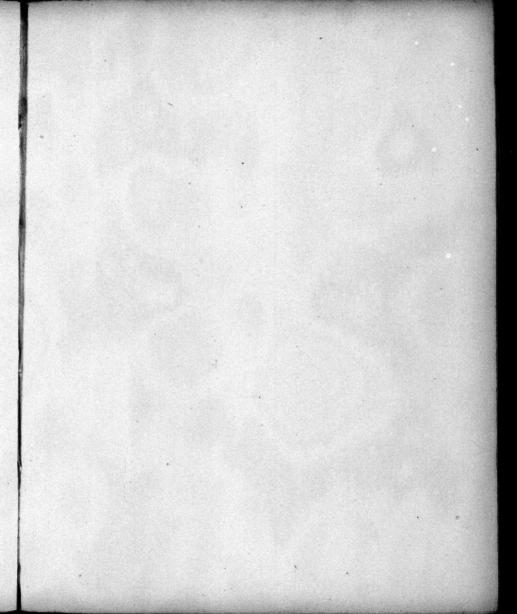
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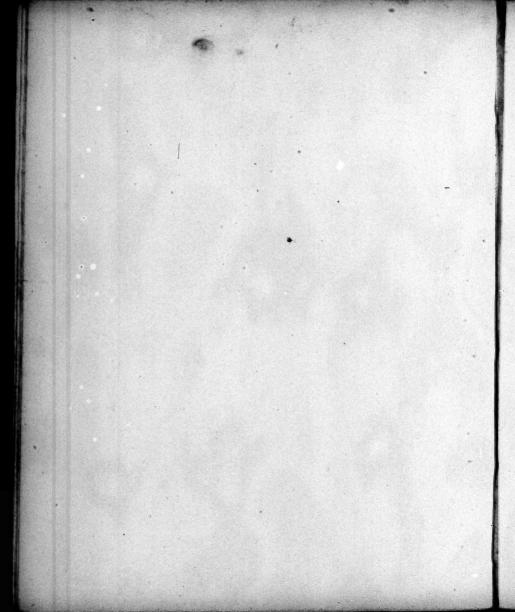
GEOGRAPHIE. The first Booke.

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For an example, we will take the city Souldon the Southamost part of Spaine, and Bilbao on the North side: the space betwirt those places being taken with a threed or a compasse, and applyed to one of the greater Circles, will containe about 6 degrees; which being multiplyed by 60, and so converted into Isalan miles, will produce 3 60: and so many miles those Cities are to be esteemed distant the one from the other.

The end of the first Books.





GEOGRAPHY THE SECOND BOOKE

CONTAINING THE GENERALL
Topicall part thereof.

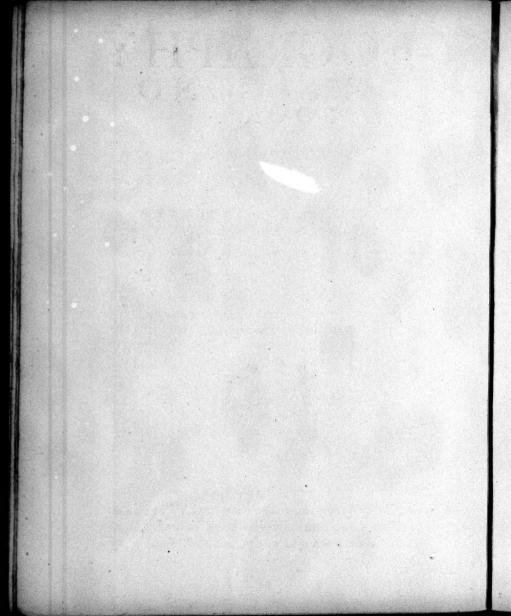
By NATHANAEL CARPENTER
Fellow of Exceter Colledge
in Oxford.

GENES. I. ver. 10.

And God called the Dry-land, Earth; and the gathering together of the waters called he Seas: and God fam that it mas good.



OXFORD,
Printed by IOHN LICHFIELD and WILLIAM
TVRNER, Printers to the famous University,
for HENRY CRIPPS. An. Dom. 1625.





TO THE RIGHT HONOVRABLE

PHILIP,

EARLE OF MOVINTGOMERY

et)c: Knight of the most Noble order of the Garter, & Steward of the famous Vniverfity of Oxford.

Right Honourable,



His Geographicall Treatife confisting of two parts, was in the very birth in such fort confecrated to your inestimable Brother, as notwitha standing it to farre reserved

it selfe, to awaite your Honours favour, that Both may seeme, as to share a part, so to chal-

THE EPISTLE

challenge the whole in my poore Industrie. The Soule of man which some Philosophers imagine, to be all in all, and all in every part, feemes to me no where better refembled then in your Generous Fraternity; wherein the Soule of Heroicall Magnificence, though Individed in it selfe, so entirely communicates herselfe to either, that both may seeme at once to enion her presence, while neither want. If this my bold attempt in presenting to your Honours hands these vnworthy labours, without any former reference, might be interpreted intrusion, it were enough for Ingenuity to pretend, that your generous loue vnto our poore Colledge and the respective duty wherein the Colledge alwayes stands obliged vnto your Honour, commands my penne beyond manners or ability. Your affection to our bouse, could no way expresse it selfe ampler then by truffing our cultody, with the charge of

R.Ld. D. your choicest lewell: A Gentleman of that towardly wit and sweete disposition, that Learning and Morality commonly reputed the daughters of time, seeme in him scarce beholding to yeares, and to challenge a precedency before

DEDICATORY.

before experience; insomuch that our ancient Mother markt out with all the Characters of age and declining weakenesse, cherishing in her bosome this yong darling, seemes to resume her youthfull habit, and triumph ouer Time and Ruines. This happines amongst diverse o. thers vouchfated by your Honor to the place, for whole good opinion the best part of mine endevours stand engaged, hath encouraged my hopes to promile me your indulgent Acceptance of this slender piece, long fince intended and devoted, as my selfe, vnto your feruice: In which confidence, fearing any longer to trespasse on your serious and high imployments endebted to your King and Countrey, I humbly rest

Your Honours in all duty and feruice to be commanded

NATHANAEL CARPENTER.

The second second in in the state of Maria Maria Maria

A TARLE OF THE SEVE-RALL CONTENTS OF THE SECOND BOOKE OF GEOGRAPHY ACCOR-DING TO THE SPECI-ALL THEOREMES.

CHAP. I.

OFT	opog	raphy	and	the l	Vature of	a p	lace.
1000				,			

inhabited.

The Terrestrial Spheare is every-where babitable.

All places of the Earth have suffred manifold mutation
and changes, as well in name as nature.

Pag. 6

Places having long continued without habitation, are seldome so healthy and sit for dwelling, as those which have bin

CHAP. II. Of the generall Adiuncts of places. The manner how to measure the magnitude of a Region by the Diameter both according to breadth and length. Is a Of the measuring of a Countrey by the circuite of it: 17 5 The Measuring of a Country by the circuite is deceitfull, and subject to great errour. 4 Those Regions are more exactly measured which partake of a plaine surface. 3 How Countries are bounded. 20 6 Naturall bounds are more certaine then Artificiall. ibid. 7 Equall bounds containe not alwaies equall Regions. 21 1 Of the quality of a Region. 21 o Speciall places are endowed with speciall Tempers and dispofitions. Of the magneticall affections of a place, as Variation and

ticall affections of a place, as V ariation and

Declina-

	Declination.	26
"	The magnesscall uni instants of no we for the first find	ing
	one of the Longitude: yet may it ferme to good purp	10/0
		27
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THE SECOND BOOKE.

CHAP. I.

Of Topographie and the nature of a place.



Sods affiftance, we have treated of the Spharicall part of Geographie: It will in the second place seeme convenient to speake of the Topicall part of it.

2 The Topicall part teacheth the description of the Terrestrial Globe, so farre forth as it is divided into places.

The nature of Topographie, whereof we are to treat in this fecond part, is discoursed vnto vs, not only in the name, which promiseth a description of places; but also in the differences fet down by Ptolomey himselfe, betwixt the Spharicall and Topicall part: the former of which he cals Geographie, and the lat-

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ter Topographie; whereof we have spoken at large in the first Chapter of our former booke. Here enely we will note this one diffinction, that Topographie may be taken either more generally, or specially: Generally we may take it so farre foorth, as it discouers vnto vs either, the whole world and all his parts, or at least some great and principall parts; such as is an Empire, Region, Kingdome, or tuch like. More specially and particularly, it hath viually beene taken for the description of a very small place, whose figuation in respect of the heavens is not noted, but of the paris one to the other: finch as are Cities, Burrowes, Townes, Caftles, Lakes, and Rivers. The former (whereat we hiefly aime) cannot well be performed without the vse of the Sphericall part: The latter we will more sparingly touch, being an infinite taske in the whole earth to descend to all particulars which come in our way : yet shall we not altogether omit or negled fuch circumlances in their due places, so farrefoorth as we can; leaving the rest to fuch Topographirs, who spend their stocke in the description of some particular place or Region: whereof this our Age hath produced many deferuing high commendations. This Science was anciently adorned by Homer, Anaximander, Milefins, Hacataus, Democritus, Endorus, Dicaarchus, Enphorus, as we finde in Straboes first booke: to which afterward succeede, Eratofthenes, Porb.w, Possidonius, and divers others. Which part requires little or small knowledge in the Sciences Mashematicall, but challengeth more affinity with the Physicall and Politicall part of Philosophie; and the retore is more subject to popular vinderstanding then the former, and may without it, affoord some profit to the Reader.

3 The Topicall part is either generall, or speciall: The generall is that which handles the generall Adiuncts of a place.

4 A place is a superficial space of the Ter-

restriall Globe, fitted for habitation.

To the confliction of a place (as it is here Topographically taken)there ought to be a concurrence of two things, which we may call Matter and Forme. Tie Matter is the space contaired; or superficiall platforme of the earth whereon we dwell. The forme is the capability or aptnesse of it for habitation; both which concurring together are conceived to make a place, fuch as we here Topographically understand: for here we viderstand not a place Physically, for the receptacle of a naturall body; in which fenf the Heavens and all the elements are faid to have their naturall places: Nettier yet Geometrically for a plaine where na line or figure may be drawne : but Topographically for the upper face of the earth whereon people or other buing creatures may inhabite. This place as a, neares by reason and noly Scriptures was more ancient then habitation. For wheras in the first Masse the earth was inveloped with waters on enery fide, affording no place for dwelling; Almighty God is faid afterwards to have seperated and parted the waters from the dry land, making the one a Receptacle for Fishes, & such creatures of the deep, the other for a dwelling place for mankind, and such creatures as breathe vpon the land: yet hath he to provided in his druine wildome, that neither the Inhabit ints of the land can well want the Sea, nor the living creatures in the Sea want the land. The one appeares in that we are inforced to make vie of the lea, not onely for food and noprishment, whereof agreat part confisteth of fish: but alfo for our Traffique and commerce with forraine Nations, which is better effected by Seathen Land-voiages. The latter is as eafily shewed, in that the fishes of the Sea derive not only their composition, but also their proper nourishment from the land: whereof we shall have more occasion to speake hereafter. Now we are moreuer to confider, that a place may be taken in a double fenfe; first more largely for any place wherein a creature may live for longer or shorter time. Secondly, more flistly for fuch a space of earth, whereon mankinde may conveniently refide or dwell. The former comprehends not onely the land, but also the water; for experience shewes, that men in hips may for a time refide and dwell on the backe A 2

of the maine Ocean. But the latter betokening a continuance of habitation, is onely agreeable to the land: Which sense how beit it be more consonant to the common vse of speech, yet for methode sake, we are inforced to vse the former: vnder-standing by habitation, not onely a place of convenient residence, but any other whereon a creature for a time may breathe and line.

1 The Terrestriall Sphare is every webre babitable.

It was an ancient opinion (as we have formerly touched) that the earth was not every where habitable animely, in the Intern. perate Zones, whereof the one was placed in the middle of the earth, the other at the endes : the former was thought not habitable by reason of the extremity of heat; because the Sun-beames there fall perpendicularly, and fo make a greater reflection; The other for extremity of cold, by reason of the obliquity of the Sun-beames, causing little or no reflection: whence a fecond cause seemes to be drawne from the extreame drought of those places, which seemes most opposite to mans temper, requiring a reasonable degree of moisture. But notwithstanding their reasons of the ancients, it must needes be confessed as an undoubted, truth confirmed by experience of many Nauigatours, that those Regions by them imagined vnfit for habitation, are not onely habitable, but in many places very papulous. Neither want there many reasons found out by latter writers, to mittigate the rigour of this opinion : some whereof we have already touched in our former treatife. First, whereas they vrge the places vnder the Æquinoctiall to be vnhabitable by reason of intemperate heat; we may eafily aniwer, that the dayes and nights are then alwayes aquall, containing not about 12 houres, fo that the space of either being shorter, the cold of the night may well affwage the extreame heat of the day. Another reason is ordinarily taken from the extraordinarily high mountaines, commonly placed vnder the Equinoctiall, which approaching neerer the middle Region of the aire, must of necessity partake somewhat more

of cold: which daily experience can witnesse, in that their tops are coue ed with fnow even in the depth of Summer. Thirdly, the necrenesse of the maine Oceanto a great part of this Region, is a great cause of this cold temper, because water is found to be by nature cold. Fourthly, the fer and certaine windes by nature ordained to blow in the hottest times of the yeare, may adde much to temperature. Fiftly, the extraordinary Raines & showers which those places suffer, which are under the Line, especially when the Sunne is verticall, are a great cause of the affwaging of the heat of the Sunne. Lattly, the custome of the Inhabitants being from their cradles inured to no other quality or disposition of the ayre, will take away much from out admiration. On the other fide no smal reasons may be shewed, why, the Regions lying neere or under the Pole should not be foextreamely cold, but that they may admit of habitation. First, because the Sunne being for fix moneths together aboue their Horizon, must needs impresse into the Ayre more heat then otherwise it would doe. Befides, the thicknesse incorporated (as it were) with heat, must needs receauce into it more degrees of it then a thinner and more refined ayie, because the intention of the quality most commonly supposeth the condensation or thickning of the subject wherein it is. But no greater reason can be shewed in this point then the custome of the Northerne inhabitants, exposed from their infaney to no other temperament. If we should aske a reason why we ynmaske our faces against the encounter of the greatest cold, being a foft and tender part, not daring to vincouer our other parts, what reason can a man invent but custome? If any should aske why barbarous people living in farre colder climites then this of ours, goe altogether naked, whereas the cold is mother of many difeases amongst vs who goe alwaies clothed; only vie and custome can yeeld an answere. These reafons make it probable enough, that no place of the whole world is by nature made not habitable. Now that it is not only inhabitable by nature, but also for the most part truely inhabited, will appeare as eafily, if we trust the testimony of Navigatours which have discouered few or no Regions wan-

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ting forme Inhabitants. But that this proposition may be more diffinelly understood, we must know that it e whole world is divided into Sea and Land, for the Sea we may call it habitable in that large sense before mentioned; to wit, that on it every where men in ships may breath and live; which is plaine out of experience of Nauigatours, who have failed round about the Earth from halt to Welf, and have encied forre towards the North and South: where at least some times of the yeare, or other they might finde the way paffable: For the land which is here principally understood, wee must note that it may bee confidered two waies; either for every little quillet or parcell of land contained in the Superficies of the Earth; or elfe for a certaine Region of some indifferent greatnesse. In the former fense, it were too much to affirme every part of the Earth to be habitable; for a fmuch as many places, as the toppes of the Alpes, or the fands of Africa, properly admit of no habitation; yet in an improper & large fense they may be called habitable, because on them a man may live and breath for a certaine space of time. But if by the parts of the land wee understand some reasonable greatnesse, no great doubt can bee made, but that it is either already inhabited by mankinde, or can a least admit of habitation, as that which not only for a time affords a man life and breath, but also some convenient meanes of suflenance; for no country hath ever beene found fo indigent & barren of all vitall aides, which is neither capcable of living creatures in the land, fit for mans nour shment; or that cannot drawe Fiftes from the Sea; or it this should faile, cannot afford Fruits or Herbage from the ground: or in case all the rest were deficient cannot have paffage by Water to other Countries, whence to relieve their necessities. And no question but nature hath stored enery Country with some commodity or other which by trafficke may drawe riches from other Regions, as by instances may more particularly appeare hereafter when we shall speake of particular regions, and their scuerall accidents.

2 Allplaces of the Earth have suffered manifold fold alteration and change as well in Name as Nature.

I need not spend time to demonstrate this Assertion, for that enery place of the Earth hath beene subject to much mutation in the processe of time, as well in Nature of the Soyle as of the Inhabitants a few obvious instances in each Countrie will eahis confice ver will it not feeme amiffe. I hope, to flew the progresse, manner, and causes of this alteration, which would give no small suisfact on. To discourse of all changes according to all times were a matter infinite: We may referre all to two heads, to wit, the change of Names, and the change of Nature. Concerning the former that most Countries have changed their first and origina I names, is most evident to such as confult the Maps and writings of our common Geographers: for few or none will discouer vinto vs any Region by that name, by which it was knowne in former times: infomuch, as great con rouerfie & dispute hath grown about diverse countries mentioned by ancient writers, whereof the name should take its first origin !!; but of this change we shal speak hereafter. But if we confide the natural changes of Couries fithence the first ce tien wee shall finde them to have suffered as well in the nature Haccidents, and disposition of the soile, as the temper of the nhabita is; concerning the former we may note a twofold alteration, whereof the one is a progresse from Imperfection to Perfection the other contratiwite, from Perfectionto Imperfection. The first groweth out of the general Induthre of mankingle, which is wont to worke every thing as neere as it center his best rids and vse, for his owne good and propagation of his kinde; which warm w best fin lain the first origrade of the world, he helt gound work of coull focietie; for man being ence expelled out of Paradife for his owne transgreffon, las etchin norverhitanding for his lot the whole word offides, which no q eltion he four as in the cradle of Nature a proce infact, as yet altogether vnfashioned and vnfraped for human habitation. For who can imagine the earth at that tim. to be any otherwise then as a vast Wilderneste all ouergrowne

ouergrowne with briers and bushes growing of their owne accord out of the Earth: Moreover what Fennes, Bog res, Marifbes, and other fuch incombrances could there be wanting to those places which never yet felt the chastifing hand of bufbandrie? All these incommodities, as mankind began to multiplie & propagate it selfe on the face of the Earth, were by little & little remoued, and the Earth reduced into a better forme for humane dwelling: because euery man choosing out his owne possession, began presently to till & manure the foyle with all heedfull industrie. For if our first Parents being placed in Paradife it selfe, the most pleasant & fertile portion of the whole world, were neuertheleffe enjoyned to dreffe and manure the Garden for their better vie and profit; what shall we imagine of the other parts of the Earth, which (no dcubt) a thousand degrees come short of this perfection: especially knowing this curse to bee laid on man by our Creatour: That he should eat his bread in the sweat of his browes; as though the earth were bound to open her treasures onely to mans paines and labour. And howfocuer the diligence of mankinde hath gone very far in adorning and fashioning the upper face of the earth, vet bath it not waded so farre, but that many places in our times are lefe altogether rude and vncultered, groaning vnder vast Wildernesses and unprefitable desarts. For times past we might have for instance, gove no farther then Britanie and Germanie; both which Countries we shall finde in these daies to differ as much from the daies of Cafar, as Cafar judged them to differ from the Remane Territory; which no doubt he preferred before all parts of Europe. Not withflanding this generall inclination of mankinde to perfect their dwelling places for their better case and comfort, we shall finde many waies whereby the parts of the Earth haue degenerated, & proued more unfit for humane habitation then in tormer times. The first which is the greatest, and cause of all the rest, is that Curse which our Almighty Creatour cast on the whole Earth for Adams fake, which afterward feemes renued and increased in the generall deluge, wherein all mankinde suffered for their sinnes a plague of waters. For as the estate of mankind immediatly before the Flood

was farre better thea that afterwards, so was the estate of Paradice farre better then that : So as wee may note from the besinning of the world a generall defect and weakreffe of the Creatures, still more and more declining from their original! perfection granted in the first creation. So that many great Philosophers have conicetured, not without ground, that the world from the first creation hath suffered the change of ages fensibly, and this wherein we live to bee the last and decrepite age, wherein Nature lieth languishing, as ready to breath out her latt. Burthis opinion feemes to be controlled by reason; forasmuch as we finde not a proportionall decrement and desect of naturally igour in things, as well in man as other creatures. For if we compare the estate of a man before the Flood, with the age of David long after, we shall finde a great disparity in the proportionall decrement of the Yeares and Ages of men: for a fmuch as many before the Flood attained to 800, & fome as Methusalem, to 900 yeares: But in Davids time, the daies of mans life (as he himselfe testifieth) are threescore and ten: & admit we understand this speech of David to be meant onely of his chiefest strength and livelihood, we shal yet finde a great diversity, because man is understood to bee in his greatest strength and vigour in his middle age; so that the whole age of man by this account furmounts not 140 yeares. To which proportion of defect or decremet our times can no way agree, because many men in our daies come neere the same age, as we fee by experience, which may be confirmed by diverse instances, whereof we will produce only two: the one of a certaine Indian presented to Soliman the Turke, being of the age of 200 yeares: the other of the Counteffe of Desmond in Ireland (which S' Walter Rauleigh mentions to this purpose) who was married in Edward the fourth's time, yet was aliue very lately. But to this doubt I might answere, that this extraordinary difference betwixt the ages of men, between the Patriarchs & Davids time compared with men, ages betwixt Davids and our daies, came from two especiall causes: First by the vniuerfall Deluge, which caused a generall defect and decay of nature in the whole earth, the like whereof hath not fince bin found: Secondly

Secondly, it was (as it seemes) much impaired by the Intemperance and luxurious diet of those times, which added much to this generall weaknesse of nature : for a smuch as the children can have little'or no naturall perfection in themselves more the is deriued vnto them by their parents. For nothing can give that to others which it never had it felfe; whence it must needs come to passe, that the posteritie derived from luxurious and distempered bodies, should proue as weake and imporent generally (if not more) then their Parents. Now why the people foone voon the Flood should finde their distemperature more noxious and prejudiciall to long life then the men of our age, a good reason may be given; because the Earth long after the Flood had not fully receased that natura! I hat & spirit which it lost in the Deluge. So that all things arising out of it, as Plants, Hearbs Fruits, and living creatures feeding thereon. proued for a while more vnwholfome and vnnaturall, then in tome yeares after, when it had somewhat reuiued it selfe by the heat of the Sunne and the Starres, & by little & little returned to his owne nature. The other cause of deficiencie is more speciall, as not happening to all, but to diverfe parts of the Earth, and that more at one time then another: as the neglect of due manuring many places, caused commonly two waies; either by contagion naturally incident to diverse places, or by hostile Invalion and devaltation: of this latter arise two maine effects: The first is the want and scarcity of Inhabitants, which should dresse and manure the ground to make it more fruitfull and accommodate to mans vie. The second is their poverty and eaptivity; whereof the one makes them viable, the second viwilling to effect any great matter for the benefit of the Land. A good instance whereof we may finde in the land of Palestine: which in times past by God hin felfe was called, A land flowing with milke and hony, for the admirable pleafantneffe & fertilitie of the Soile: yet at this day, if wee will credit travellers report, a most barren Region, deuoid almost of all good commodity fit for the vie of man; in the ruines of which fometimes famous kingdome, cuery bleare-eied judgement may eafily read Gods curfe long fince denounced: Which strange alteration

teration next vnto Gods anger we can ascribe to no other cause then the holfile inuafion of torraine enimies, which hath almost left the land waste without the natine Inhabitants; whence it could not chuse in a short time but degenerate from the ancient fruitfulnesse. The like may we finde in all those miserable Regions which groane at this day under the tyrannie of the vfurping Turke: whence a prouerbe runnes currant amongst them: That where the Turkes horse hath once grazed, no graffe will ever after grow: which fignifies no other then the barbarous manner of the Turkes, having once conquered a land, to laie it open euer after to deuastation: for being for the most part warlike men trained vp in martiall discipline, they little or nothing at all regard the vie of husbandrie: whence in short time a Countrie must needs turne wild and vntruitfull. To thefe causes we may adde the influence of heavenly constellations, which being varied according to the times, produce no small effects in the changes and alterations of the Earth. The diverse alteration in the disposition of the Inhabitants which was our fecond point, we have referred to another place neare the end of this tract, to which it properly appertaines.

3 Places having long continued without habitation are seldome so healthie and fit for dwelling as those which have beene inhabited.

This Propolition I have knowne to be warranted by the Teffimonie of many experienced Nauigators: infomuch as I prefume few men can doubt of the truth of it, which hath either beene a Traueller himselfe into farre Countries, or at least hath read other mens discoveries. The onely matter therefore wee here intend, is to produce certaine causes of this effect, to give satisfaction to such as make a distinction betwixt the knowledge of the effect, and inquiry of the cause. The first cause which I can alleage is the industrie of mankinde inhabiting any Countrie (mentioned in the former Theorem) out of which ariseth a twofold effect. I The improving of the Soyle, by removing all such impediments as otherwise would prove noifome to mankinde, for whereas all things growing of their

owne accord, are suffered to rot into the ground in like manner, what other can we expect but Fennes, Fogges, & noisome vapours, altogether hurtfull to the welfare and life of man. 2 The profit of mans industrie is no leffe apparent in manuring the ground, & opening the vpper face of the Earth; which being composed of diverse substances, sendeth forth many times certaine hot fumes and vapours, which in many cold Countries mollifie the viuall rigour of the Aire, which most offends the Inhabitants. This reason is given by my Countriman Captaine Whitherne for the extreame cold, which some men professe theinselnes to have tried in New-found-land, which nevertheleffe, according to many mens defeription, is knowne to lye farre more South then England: for the natives of the Country being for the most part driven into the North part by the Europeans, who viually trade there for fish, and they themselves living altogether on Fish from the Sea, or some wild beafts on the land, as Beares, Deare, and fuch like; without any manuring of the ground for herbage; The Soyle by them is in a maner left altogether vnmanured : fo that neither the foyle can be well cleanfed from noisome vapours arifing from the putrefaction of herbage rotting (as I faid) into the ground, or left free to fend out fuch wholfome fumes and vapours from its interiour parts, which may warme the Ayre. and preferue mankind. 3 A third reason drawn from mens Industries, that those Countries which have injoyed Inhabitants by the continuall vie of Fires, have their Aire more purged and refined from droffie and noisome vapours, which vsually arise out of a contagious foyle, daily intected by putrefaction : for scarce any nation hath beene knowne so barbarous & ignorant which hath not the invention and vie of Fire : neither is any infection of the aire fo pestilent, and opposite to humane constitution, which the breath of fire will not in some fort dispell. If any man object the distance of houses & villages wherin fire is vsed, which seeme to claime a small interest in the change of the ayre hanging ouer a whole Country: let him well confider the quicknesse of metion and sluidity of the Ayre , spassing (as it were) in a moment from one place to the other, and he may foone foone answere his owne objection. All those reasons hetherto mentioned an inhabited Region owes to mans industrie, which we generally touched in the precedent Theoreme. The second cause which is as a consequent of habitation, is the necessitie of breathing of people living in any Region of the Earth : whereby may follow two effects. I A certaine measure of heat imprefled into the aire, as we fee in any roome in a great throng of people, by reason of their breathing together in one place. 2 The affimilation of the Aire to humane bodies, by a continuall respiration. These alterations of the aire, might perhaps to common apprehensions, seeme small and insensible. But hee that confiders how great a quantitie of aire is requifite for a mans respiration, and the space and extent of motion together with the multitude of Inhabitants in a populous Countrie, would hold it no strange matter, that the breathing of men should breed such an alteration of the aire: we finde by experience, that strong built houses being lest tenantlesse, wil soone fall into decay, not fo much for want of reparation, as the foggy vapours and moisture, caused by want of Respiration. The like whereof in some proportion may we imagine to be in a region wanting Inhabitants, and deprived of this benefit of nature.

CHAP. II.

Of the Generall Adiuncts of Places.

Na place Topographically taken two things are to be considered.

I The Adiuncts. 2 The Expressions
The Adiuncts are such proprieties as agree to speciall places.

2 Such

2 Such Adiuncts agree to a place, either in respect of the *Earth* it selfe, or in respect of the *Heavens*: Those which agree to a place in respect of the Earth, are either *Internall*, or *Externall*.

3 The Internall I call such as are inbred in the Earth it selfe: which are of two sorts;

either Common, or Magneticall.

4 The Common are in number three. 1 The Magnitude, or extent of a Countrey. 2 The Bounds. 3 The Qualitie. The Magnitude comprehends the Length and Breadth of

any Region.

Some man might imagine that I make a needlesse repetition of these proprieties: forasmuch as many of them seeme to have beene spoken of before in our Spharicall part. But I answere that I there handled no other matters, but fuch as concerned the whole globous body of the Earth. But my intent here is to treat of such proprieties, as particularly defigne out a speciall place. For it is not one thing to speake of the Magnitude of the whole Earth, according to all its dimensions; & to treat of the manner of measuring some particular Region, marked out in the Spheare. We have defined the Magnitude of a Region to be either of Length or Breadth : because (as wee have taught in our former chapter) it is a space contained in the surface of the Earth. Then can it not according to Geometricall grounds, exceed two Dimensions: These two Dimensions (as we have faid) are length and breadth, whereof every plaine figure, or superficies consists.

5 The Magnitude of a Region may be meafured fured two waies: either by the Diameter, or the Circumference. The Diameter is confidered either in Latitude or Longitude: of the Latitude, whence ariseth the Breadth of a Country from North or South, note these Rules.

I If the place whose breadth is sought, bee distant from the Æquatour, and be wholy situat in the same Hemssheare, the lesser Latitude subtracted from the greater will give the Diameter.

To put this Rule in practife, it behooues the Topographer, who would finde out the greatnesse of any Region, to observe two Latitudes: to wit, to measure the Latitude in the most Northerne point, where it is greatest : as also in the Southerne point, where it is leaft of all. This latter subducted from the former, will give the Diameter or breadth from North to South: which may eafily, according to the Rules in the former booke, be reduced into Miles, or other fuch measures. For an example we need goe no farther then our Hand of Great Brittaine: The Southmost part of which lying about Star-point in Deven, hath in Latitude about 50 degrees: The Northermost point fituate neere the mouth of the river Ardureus in the farthermost part of Scotland, hath in Latitude about 60 degrees (to omit minutes) The leffer of these Latitudes subtracted from the greater, the refidue will be 10 degrees, which being imagined in the Meridian which is a greater circle, are to bee multiplied by 60, and fo converted into Miles, which will bee 600 the length of Brittany from South to North.

 If the place whose Magnitude we enquire, be wonder the Æquatour, the Southerne Latitude added

added to the Northerne wil shew the breadth from the North to the South.

To illustrate this by an example, we will take the whole contiment of Africa, whose Southerne Latitude about the Cape of Godd hope, we shall finde to be neere thirty Degrees: the most Northerne Latitude about the straights of Gibralter, very neer the same rate: These two summes added together will amount to 60 Degrees, which multiplied by 60, the number of miles answerable to a degree in a great circle (because we suppose it here to be an Arch of the Meridian) we shall have 3600 miles, the breadth of Africa from South to North.

4 The measure of the length of a Region betwixt East and West, admits of two cases: for either the Country is supposed to bee without the first Meridian, or vnder it: both

which shall be taught in these Rules.

1 If the Region be situate without the first Me. ridian, the lesser Longitude subtracted from the greater, will shew the Diameter betwixt

East and West.

For an example of which we will take Cape de Baren, lying over against S. Thomas Iland in Africa, vinder the Aguarour, whose Longitude is about 30 Degrees, and Melinde fituate neere the Aquatour ouer against Sinus Barbarieus, on the other side of Africa, which hath in Longitude 63 Degrees. The least Longitude, to wit 30, being subducted from 63, there will remaine 32 Degrees; which being taken in a greater circle, which is the Equatour, or a Parallell very neere (which admits no sensible difference) we multiplie by 60, and there will arise 1980 Ital an miles, but if the Degrees bee taken in one of the leffer Patallells, we must proceed according to the Table of miles answerable to Degrees of Latitude in the former booke. Another 7 Another Case is when the place is situate vnder the first Meridian: The length & mea-sure of such a Region is found out by this Rule.

1 Let the Westerne Longitude be subtracted out of the whole circle, and to the Tresidue added the Easterne Longitude, the summe will give the greatnesse and distance betwixt East and

West.

For an instance we will take Greenland, supposed in most of our Globes and Mappes, to be an Ilar d which is set down directly under the fiest Meridian passing by the Azores in Karius his Globe: It hath assigned it for Westerne Longitude about 3 o Degices: so Easterne Longitude about 3 o Degices: so Easterne Longitude about 30 degrees. Then according to our Rule 340 be subtracted from 360, the whole circle, there will remaine 20, which being added to 30 the Easterne Longitude there will arise 50: which being multiplied by 25, the number of miles answerable to the Latitude of the place, being about 65, there will be produced 1250 Italian miles, the d stance or length betwirt the East & the West part of Greenland.

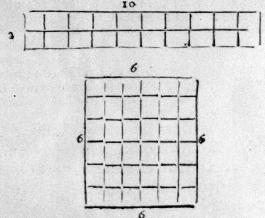
8 Hitherto of the measuring of Countries by the Diameter, the other way is performed by the circuit: which manner of measuring we will briefly censure in these two Propo-

fitions.

I The measuring of any Country by the Circuit of it, is very deceitfull and full of errours.

It hath beene a common custome amongst Navigatours to sudge of the greatnesse of any Country, by sayling round a-

bout it: which kind of measuring is not alwaies to be reiected foral much as in new discoueries sometimes no other way can be had. Neuerthelesse this manner of measuring must needs proue very vacertaine for diverse reasons. First in regard of the motion of the ship, which by reason of dinerse and contrary winds, which must needs happen very frequently, cannot alwaies moue with the same swiftnesse. Secondly because the Sea it selfe (as we shall hereafter shew) hath in diverse places diverse special motions and currents, as from the East to West whence it must needs inforce an inaquality of motion in the ship. The third reason, which is greater then all the rest, is drawn from the various Figuration of Countries, whose greatnesse cannot be knowne by the circumference. Because (as Geometricians teach vs) two figures may have one & the felfe same circuit about them, and yet the one shall extraordinarily exceed the other in greatnesse; as for example, let there be ima-



gined two Parallelogrammes; the one an exact square of fix foot; the other a long square of 10 foot in Length, and two in Breadth. The one comprehends 36 square feet, the other 20,

as will appeare by multiplication of their fides, the one into the other: in which numbers there is a great inaquality. Yet notwithstanding if we measure the circuit or circumference of each Figure, we shall finde them aquall, to wit, of 24 foot, as will appeare by their figures here prefixed. For amongst those Figures called Isoperimetrall, or of aquall Perimeter, that is alwaies to be esteemed the greatest, which is the more Ordinate figure: which is that, which commeth neerest to an aqualitie of Sides and Angles. But in Inordinate Figures (of which nature for the most part are all Regions) infinite errour may bee committed, if we measure them by circumnauigation: wherefore to measure a Country more exactly it behoves the vs not only to know the Circumference, but also the Diameter.

2 Those Countries are more exactly measured which partake of a plaine surface.

The reason of this Propositio is easily thewed, because a plaine Superficies consists of right lines. But a right line (as Enclide witneffeth) is the shortest betwixt his owne bounds: whereas betweene two points infinite crooked lines may bee drawnet whence it must needs follow, that more certainty and exactnesse is to bee expected in the measure of a Plaine Counwhose Diameter is a Right line, then from a Crooked and hilly trey, Region, where the Corde is crooked and gibbous. Whence some Mathematicians have demonstrated, that more men may stand on a Sphæricall Superficies, as a Hill or mountaine, then on a Plame, although both are found to be of the fame Diameter. It may be here obiected, that the earth is every where crooked and orbicular, & therefore no part thereof can be measured by a Right line: I answere that the Earth is indeed Spharicall (as we have formerly proved) yet may some little part or portion thereof be counted as a Plaine; because such parts have little or no proportion to the whole masse of the Earth. This convexity therefore being fo little, may passe for a plaine without any fensible errour. Hence wee may gather that the Land cannot fo exactly be measured as the Sea. Forasmuch as the land for the most part is vieuen, varied with hills,

Dales, and other inequalities. But the Sea euery where plaine and like it felfe, except the rifing of the waves & furges, which in fo great a diffance will make no difference at all. Secondly, we may hence collect that of two Countries of the fame bounds and figure, that must be the greatest whose soyle and superficies is most varied and crooked; because (as wee have faid) crooked lines betwixt the same points are longer then high, and therefore measure the greater Magnitude.

Thus much of the Magnitude. The Bound

of a Country is a line compassing it round. This definition is very evident, in that every Region is Topographically confidered as a Plaine or Superficies, whose bound is a line compassing it round: for as a Line is bounded by a Point, To a Superficies by a Line, as we are taught in Geometry. Now we must consider that the bounds of Countries may bee taken two manner of waies. First Geometrically, for the meere line, which is imagined to goe round about it: Secondly, Geoeraphically, for the visible markes and Characters, whereby the line is traced out vnto vs, fuch as are Rivers, Citties, Hills, Caftles, and such like. These markes whereby a Topographer noteth out voto vs the bounds and limits of Countries, are of two fores; either Naturall or Artificiall. The naturall are fuch as are derived from nature without mans appointment, such as are Rivers, Creekes, Mountaines, Woods, & fuch like other matters, which bound the extents of Countries. The Artificiall bounds are such as depend vpon some constitution or decree of a man, which fo divide one Country from another: the partition being often made where no notable marke or bound is fet by nature.

1 Naturall bounds are more certaine then Ar-

tificiall.

The reason is because naturall signes or markes which are set for bounds of Countries a e alwaies the same, and (as it were) continued from the first creation; and cannot be changed without some great Earthquake, Insundation, or such like alteration

in nature, which very seldome happeneth; and in very sew places; whereas on the contrary part, such bounds and limits, as depend your mans appointment, may be altered and changed according to the wills and dispositions of men; as we daily see amongst vs, that ancient lands and inheritances are which glear controuers is made amongst Geographers concerning the bounding of Countries and Territories, anciently knowne and defined by old writers. For names and particular contracts betwith men in a few ages, may easily ship out of memory; especially when the possessions themselves (as it of the stappens) struct o extinguish and raze out the memory of former ages, leaving behind them no marke or signe to tell the world their wronged neighbours right, or the limited fortunes of their owne possessions.

2 Agualt bounds doe not alwales containes aquall Regions.

This Proposition is plainely demonstrated before in this very Chapter: wherein wee have proved of two sigures supposed a quall in the circumference, that to be the greatest, which more neerely approacheth an Ordinate sigure: which wee define to be that which commets neerest to an equality of Sider and Angles. So that two Regions, the one round, the other square, may have an equal compasse about, and yet the former will be a great dealegreater, in respect of the space there-in contained.

Quality. By the quality I understand the natural temper and disposition of a certaine place.

I Speciall places are endowed with speciall tempers and dispositions.

That Almighty God, who created the whole world, hath not

granted the same gifts and indowments to all Countries, but hath divided diverse commodities to diverse Regions, seemeth aimatter out of all controuerfie. For who findes not by experience one Country bet, another cold, a third temperate: one fruitfull, another barren, a third endifferent, one healthie, another unwholfome. The like diversitie is also found in the Inhabitants themselves, according to that common proverbe: Valentes Thebans, Acutiores Atticis whence this diversity should arife, it is a hard matter to vnfold; foralmuch as many causes herein concurre, sometimes to helpe, sometimes to crosse one the other: yet will I striue as necre as I can to reduce them to certaine Heads, by which a generall guesse may bee given to the particulars. The first reason may bee drawne from the situation of the Earth, in respect of the heaven & Starres therein fixed. This may cause a diversitie of disposition two waies; I By reason of the Sun, and his generall light & influxe: whence in the Earth are ingendred the foure first qualities of Heate, Cold, Drouth, and Moisture, whereon depends a great part of the disposition, not only of the soyle, but also of mans body; forafmuch as the one ordinarily borrowes his fruitfulneffe or barrenneffe of thefe first qualities: and the other hath his vitall Organes (which are the ministers of the Soule) much affected with them; infomuch as fome Philosophers have vndertaken to define all the differences of mens wits and intellectuall faculties out of the Temperament of the braine, according to these foure accidents. And what Physitian will not acknowledge, all these Qualities and their mixture to challenge an extraordinary preheminence in the disposition and constitution of mans body, whose mixture is the first ground of health or ficknesse. The second meanes whereby the Heavens may cause a divertitie of Temper in diverse places, is from the Special Influences of some particular Starres and confiellations incident to particular places: for it were blockish to imagine that so many various Statres of ditterfe colours & magnitudes should be fet in the Firmament to no other vie then to give light to the world, and diffinguish the times: fith the ordinary Physicia can eafily discouer the Moones influence by the increase of humours

mours in mans body; and the exp rience of Aftrologers will warrant much more by their observation: as affigning to each particular aspect of the Heavens a particular and speciall influence and operation. Now it is enident that all aspects of the Heavens cannot point out and defigue all places alike; foralmuch as the beames wherein it is conveyed, are formewhere perpendicularly, other where obliquely datted, and that more or leffe according to the place: whence it commeth to paffe that neither all places can in oy the fame Temperament, nor the fame measure and proportion. Yet wee fay not that the headenly bodies have any power to impole a Necessia: your the wills and dispositions of men; but only an inclination: For the Starres worke not Immediatly on the intellectuall part or minde of man, but Mediatly, fo farre forth as it depends on the Temperament and materiall organes of the body. But of this we shall especially speake hereafter. Where (God willing) thall be opened the manner of this coelettiall operation, By this we may understand how farre the Heavens have powo er to cause a diuerfitie in Places and Nations. The second reafon may be the Inbred Qualitie, Figure, and Site of the Places themselves; For that there is another cause of diversitie besides the fituation of places in respect of the Heauens, may easily be proved out of experience; for we finde that places fituate vnder the same Latitude, partake of a diverse and or posite Temper & disposition, as the middle of Spaine about Toledo, which is very hot and the Southermost bound of Unginia, which is found to be Temperate betwixt both: All which not withfranding are under the felfe fame Latitude, or very neere, without any sensible degree of difference: also we sometimes finde places more Southward toward the Æquatour to partake more of cold, then fuch as are more Northerne, as the Toppes of the Alps being perpetually covered with Snow, are wishout que-Rio colder then England, although they lie neerer to the aquinoctiall. Likewise Alvares reporteth that he saw Ice vpon the water in the Aby fines Courry in the month of July, which not wirbstanding is neere or vader the Line. And Marim Frobilher relates, that he found the ayre about Friezland more cold &z formy.

formy about 61 degrees the in other places neere 70 degrees. Wherefore we must needs ascribe some effect and operation to the foyle ir felfe: first in respect of the Superficies which is diverfly varied with Woods , Rivers, Marifles, Rocker, Monntaines, Vallies, Plaines; whence a double varietie arifeth: field of the foure first Qualities, which is caused by the Sunne-beames being diverily projected according to the conformity of the place: Secondly of Meteers and Exhalations drawne up from the Easth into the Aire: both which concurring must needs cause a great varietie in mans disposition: according to that prouerb, Athenis tenne calum, Thebis craffum: or that bitter taunt of the Poet on Bæotians, Bæotum in crasso invares aëre natum. For ordinary experience will often shew that a thinne & Tharp avre vinally produceth the best witts; as contratiwise groffe and thicke vapours drawne from muddie and marish grounds thicken and stupisfie the spirits, and produce men comonly of blockish and hoggish dispositions and natures, viapt for learning, and wifit for civil conversation. Secondly, there must needs be granted to special Countries, certaine Specificall qualities, which produce a certaine Sympathie or Antipathie in respect of some things or others: whence it commeth to passe that some plants & hearbs, which of their owner coord spring out of the Earth in forme Countries, are found to pine and wither in others: some Bealts and Serpents are in some places seldome knowne to breed or live, wherewith not with flanding other Regions swarme in abundance: as for example, Ireland, wherein no Screent or venemous worme hath beene knowne to here .. whereby Africa and many other Countries finde no smill molestation. Neither is this variety only shewne in the direthey of the kindes, but also in the variation of things in the same kinde, whereof we might produce infinite examples. For who knowes not, which is a Physition, that many simples apt for medicine growing in our land, come farre there in vertue of thole which are gathered in other countries. I need amongst many ordinary inflances guid no Ether then in our Rubarb and Tobacco: whereof the former growing in our Countrie. except in case of extremitie, is of novie with our Philitians: the other

as much scorned of our ordinary Tobacconists: yet both generally derived from the true mother the Indies, in great vie & request. But of this last Instances are most common, and yet for their ignorance of the true cause, most admirable. The caufes of the former might in some fort be found out either in the Heatiens, or in the Elementary nature of the Earth. But fome speciall proprieties have discovered themselves, which cannot be imagined to owe their cause to either, but to some third o. riginall, which the Physicians in their Simples more properly tearme virtus fecifica. If any man should demand why countries farther from the course of the Sunne should be found hotter, then some which are needer? Why the Rhenish wine Grape transported from German into Spaine, should yeeld vs the Sherry Sacke? Euery ordinary Philosopher, which hath travelled little beyond Ariflotles Materia Prima, will be ready to hammer out a cause, as a scribing the former to the Heigth or Depreffion of the foile; the latter to the excesse of heat in Spain about that of Germany. But should we farther demand, I why Ireland with some other Regions indure no venomous thing. 2 Why Wheat in S. Thomas Hand, should shut up all into the Blade, and neuer beare graine? 3 Why in the same Iland no fruit which hath any flone in it, will euer profeer? 4 Why our Mastiffes (a serviceable kinde of creature against the motestation of Wolues, and such hurtfull beasts) transported into France, should after a litter or two degenerate into Curres, & proue altogether unferniceable? 5 Why with vs in England, fome places produce Sheep of great stature but course wooll; other places small Sheep, but of very fine wooll: which being naturally transplanted, will in a generation or two fo degenerate the one into the others nature, that the greater fleep loofe fomewhat of their greatnesse, yet improue their sleeces; as the othe increase their stature, but loose much in the finenesse of their wooll? 6 Why many places at the ridge of the mountaines Ands in America cannot bee passed over without ex-Teame vomitting and griping even vnto death. 7 Why a River in the Indies should have such a nature to breed a great long worme in a mans leg, which oftentimes proues mortall vnto

vnto the patient, with infinite the like examples found in Geo. graphers, concerning the nature and accidents of Fountaines, Hearbs, Trees, Beafts, and Men themselves (as wee shall shew hereafter) so much varied according to the disposition of the foyle, what wifer answer can an ingenious man expect then filence or admiration? for to make recourse to Sympathies, Antipathies, and fuch hidden qualities with the current of our philosopher; is no other then in such fort to confesse our own ignorance, as if notwithstanding, wee desired to bee accounted learned; for belide the difference of the tearmes wherein every Mountebanke may talke downe a judicious Scholler; I fee no aduantage betwixt a Clowne which faies he is ignorant of the cause of such an effect, or of a juggling Scholler which affignes the cause to be a sympathic, antipathie, or some occult qualitie. I speake not this to countenance supine block shnesse, or to cast a blocke in the way of curious industrie. The former difposition I have alwaies bated, and the latter still wished in my felfe, and admired in others. Al which I can in this matter propole to a curious wit to be fought, must be reduced to one of these two heads: for either such admirable effects as wee have mentioned, must arise from some Formal and Specificall vertue in the soile, or from some extraordinary Temperament made out of a rare combination of the Elements, and their fecondary mixtures, as of Hearbs, Stones, Mineralls, and vapours arifing from such, and affecting the Aire: of both which wee shall have some occasion to treat in the particular Aduncts of places; yet fo, as I feare I shall neither give my selfe content, or my Reader any sufficient satisfaction. But In magnis voluife fat eft.

of the Earth Topographically taken: Next we will speake somewhat of the Magneticall Affections of a place: These are in number

two, viz: Variation and Declination.

We have in our former Treatife of the Magneticall nature of the Earth handled diverse other affections, growing from the Magneticall Temper and disposition of the terrestrials Globe: whence some man might here collect this repetition to bee altogether needlesse, or at the least imperfect, omitting many other of the Magneticall Affections. To this I answere, that it is one thing to speake of these Affections as they agree to the whole Spheare of the Earth: Another thing to confider them. as they are particular proprieties, and markes of particular places and Regions. In the former fort have we besides the Variation and Declination handled many other affections of the Earth magnetically confidered. We here only speake of these two, as they are speciall markes and proprieties of speciall places: which it behooues a Topographer to obserue as a matter worthie observation in the description of any place. The vse Chall be commended vnto vs in these two Theorems.

The Magneticall Variation is of no vse for the first finding out of the Longitude; yet may itserve to good purpose for the Recognition of

a place beretofore discouered. The reason of this we have shewne in our former booke; because the variation seldome or neuer answeres proportionally to the Longitude, as some of the ancients on false grounds have furmised: whence no true consequence can bee drawne from the variation of a place to the finding out of the Longitude; yet may it be of speciall vie for the new finding out of such pla ces as haue formerly by others beene first discovered, so the variation were first by them diligently and faithfully noted and observed: first because sew places in the Earth can exactly and precisely agree in the selsesame variation; but in some Degree or minute will be found to varie. Secondly, if any two places should be found to accord in the same Degree of Variation; yet comparing the variation with the degree of Declination, wee shall commonly finde a difference: for a fmuch as places agreeing in variation, may not with flanding varie in the Declination. Thirdly D 2

Thirdly, if two places should be equalized in both (as we cannot denie it to bee possible) yet the comparing of these two Magneticall motions with other affections, aswell in respect of the Earth it selfe as of the Heauens, will give at least a probable diffinction: of which cases it is not hard out of the observations of our new writers and Nauigatours to give particular inflances. Concerning the first, we finde the variation of the compafic at Cape Verde, to be inft 7 Degrees; about the Ilands neere to Cape Verde to amount only to 4 Degrees; whence a Sea-man (if other helpes failed) may hereafter, as hee paffeth, distinguish the one from the other, and if occasion serve, correct this errour. In the like fort might a man (otherwife altogether ignorant of the place) out of former observations, in the fame Iland of Cuba diftinguish betwixt Cape Corientes and Cape S. Anthony; In that the one hath only 3 degrees of variation, whereas the other hath 13: for an instance of the fecond sale we will take the coast of Brasill 100 leagues distant from the shoare, and Cape Corientes beyond Cape bona spei, which agree in the fame variation: to wit, amounting to 7 Degrees 30 minutes: which notwithstanding are distinguishe by their fouerall variations: for howfoeuer the magneticall motion of variation being of late invented, hath not so particularly beene traced out in all or most places, yet must the declination of each place needs be different; foralimuch as the former hath 23 degrees of South Latitude, the other none awall, lying iuft vnder the Equinoctiall: fince the Latitude (as wee haue formerly raught) is in f me measure proportionall to the Declination. For the third, if any two places be found agreeing both in Variation and Declination, as may be probably gueffed of Cape Roffe in S. Iohns Hand, and the West ende of S. Iohn de Porto Rico : the Latitude being all one as of 17 degrees 44 minutes: and the variation admitting perhaps infenfible difference, to wit, of a little more then one degree : yet mi, ht this helpe conjoined with former Trauellers report, or some small observation of heavenly bodies, or founding the bottome of the Sea, settle our opinion and make a plaine distinction.

2 The Declination of any place being knowne the Latitude may also be found out, although not without some errour.

The ground of this Affertion we have formerly handled in the Treatile of the Magneticall Affections of the Earth; where we have shewed that the Declination of the Magneticall needle is alwaies answerable in some proportion to the Latitude of the place: whence it must needs follow, that the declination any where being found out together with the proportion, the Latitude must needs be knowne. In this point I referra my Reader to D. Ridleye's late Treatile of Magneticall bodies & Motions, wherein he by the helpe of M. Brigges, hath calculated a certaine briefe table for this purpose. But that this manner of Inucation of the Latitude of a place, must needs admit of fome errour, cannot well be denied; foraimuch as Gilbert, Ridley, & others, which have written of this subject, have acknowledged this motion of Declination to be in many places irregular, and not answerable in due proportion to the Degrees of Latitude, which discrete friends of mine, well experienced in magneticall experiments, have to their great wonder confessed.

The Externall, I call such as are not impressint on the Earth, but externally adjacent or adioyning vnto it. Here ought we to confider the Aire adioyning to any place with his Qualities and Proprieties.

The Ayrie properties of a place confift in fuch matters, wherevith the Ayre according to diverse places is diversly affected and disposed.

In the Ayre we ought to note at wofold temper and qualitie,
D 3 the

the one Inbred and Esentiall; the other Externall and Accidensall, The former, whether it be heat ioined with moissure, as Aristotle affirmes, or cold ioined with moissure, as some others, I leave it to the Naturall Philosopher to dispute. The latter being that to which our purpose is chiefly ingaged, and that no farther then may appertaine to the Topicall description of a speciall Country. These accidents being to various and many, we are inforced to reduce them to a few generall heads which we will couch in this our Theoreme.

The disfosition of the Ayre adjacent to a place depends chiefely on the Temperament of the

Soyle.

Those things where with the Aëriall Region is affected, are of two forts; to wit, either the Temperament confisting in the mixture of the 4 first Qualities; or elle the bodies theselues, as Meteors drawne vp into the Aire, whereof these accidentall dispositions arise. That both these chiefly depend from the Temperament of the Earthly Soile of a certaine place, many rea-Sons will demonstrate: first that Meteors, what soeuer they are take their originall from the Earth, is plaine. 1 Out of the name, which fignifies things lifted vp, to thew that a Meteor is lifted and drawne out of the Earth. 2 Out of the material! composition, which can no where else take this composition: For either we should derive it from the Heavens, or from the Arre it felfe, or from the Fire: From the Heavens it cannot take originall; because it is corruptible, and therefore of no heavenly substance according to Peripatetick Philosophie. Not from it selse, because the aire being supposed a simple and vncompounded body, cannot admit of fuch mixture. Not from the Fire; first because all Meteors partake not of fierie nature. Secondly, because fire cannot well subfist, but of some matter whereon it may worke, and conferue it felfe, which can be no other then that which is of a glutinous substance: which we no where finde but in the earthly Globe, confisting of Earth and Waier; out of whose store-houses, the matter of all such pendulous

dulous substances in the aire is derived. These Meteors may be de iued from the Earth into the Ayre two manner of waies. First, Direlly and immediatly, by an immediate ascent of rifing of exhalations from some one particular place into the Ayrie space right ouer it. Secondly, Obliquely, to wit, when Vapours, or other fuch exhalations are by some violence or other carried from one place into another: 15 winde, which being ingendred in one place, continually bloweth into another. Againe, the former may happen two waies: for either this rifing of Exhalations out of the Earth, is Ordinary, or Extraordinary: Ordinary I call that whereby the thinne parts of the water or Farth are continually spread and diffused through the whole Region of the Ayre: for we cannot imagine otherwife then that at all times and places, the Terrestriall Globe composed of Earth and Water, continually fends and euaporates out some thinne or ranfied parts, wherewith the earth is affected. Whither this Rarefaction or Euaporation of the water be the true substance of the Aire it selfe (as some haue probably coniectured) or elfe some other body different from it, I will not here dispute. This much will necessarily follow, that it proceeds originally from the Earth right vnderit. This vapour being ingendred from the water or moifter parts of the Earth, is much varied and temper'd according to the place from which it arifeth: For the matter of the Earth being various & diverse in disposition, as well in regard of various veines of minerall substances, whereof it confifts, as of the first and fecond qualities thereof arising, must of necessitie cause the Aire about each Region to be of the same qualitie. Whence a probable reason may be shewne; why of two places, although both like in respect of the Heauens, and other circumstances, one should be hot, the other cold; one healthie, another contagious; the one of a sharpe and thinne aire, the other of a foggy & dull temper: For no question but the minerall matter where of the foile of the Earth confifts, being not every where Solid and hard, but every where intermedled with a vaporous & fluide substance, must needs challenge a great interest in the Ternperament of the Ayre, as that which is the first mother, if not of 33

the Aire it selfe, yet at least of the accidentall dispositions there of. The Extraordinary evaporations. I call fuch as arise out of the Earth by some extraordinary concurse of the Sunne, with some other Starres. These are many times subject to sense, which happen not at all times and places : fuch as are clowdes, windes, and fuch like, which arise not naturally by their owne accord by a perpetuallemanation, but are by some greater strength of the Sunne or Starres rarifying the parts of the earth or water drawne vp to the Aire about it, Now for the Meteors Indirectly and obliquely belonging to any place, amongst many other instances, we may bring the winde which bloweth from one Region to another; which according to ordinarie experience partaketh of a twofold qualitie; the one derived from the place whence it is ingendred; the other from the Region through which is passeth. Which may appeare by our foure Cardinall windes, as they are with vs in England, Pelgia, and higher Germany. For first our Easterne winde is found to bee driest of all others, whereof no other cause can be given, then that it comes over a great Continent of land lying towards the East, out of which many drie & earthly exhalations are drawn: fo the Westerne winde is observed to be very moist, because it paffeth ouer the hug e Atlantick Ocean, which must needs cast forth many watrie and moist vapours, which beget raine and showres: from the modure of which Westerne winde some haue fought out an answere to that Probleme : why hunting hounds should not fent, nor hunt fo well, the winde being in the Welt, as at other times? For, fay they, it is caused by the moisture of it, either in making hinderance to their legges in running, or at least to their smell, being very thicke and foggy. In this Westerne wind we may also percease much cold, which is caused by the qualitie of those watrie vapours, through which it passeth, which being drawne from the water, are naturally cold. In our South wind we shall finde both heat and moissure: whereof the former arifeth from the Sunne, which in those Southerne Regions neere the Equatour is most prædominant; The latter from the naturall disposition of the place: because before it approacheth our coasts, it passes ouer the Mediterranean

Mediterranean Sea, out of which the Sunne begets abundance of watry vapours, which mix themselves with the win les. Finally the North-winds is observed to be cold and drie. It must of necessitie be cold: because it is carried over diverse cold and snowie places most remote from the heat of the Sunne, It is drie; because it passeth ouer many Hands and dry places, fending out flore of dry exhalations : as also because the Sunne being very remote from those Regions, fewer exhalations are drawnevp, which might in est it by impressions of their watrie qualitie. These instances may serue to proue our affertion; That Meteors, wherewith the Aire is viually charged, and by confequence, their qualities imprest into the Aire, are depending from the Earth, out of which they are drawne, either Direbtly from the same Region which they affect; or Obliquely, from some other Region semote from it. Howsever, wee obferue, that the disposition of the Ayre depends from the Soile, we cannot altogether exclude the Heauens, as shall be taught hereafter in place conucnient.

CHAP. III.

Of the Adiuncts of a place in respect of the Heavens.

E haue in the former Chapter spoken of the Adiuncts of a place in respect of it Self. We eare now to proceed to such Accidents as agree to a place, in respect of the Heavens.

The Adiun as of the Earth in respect of the Heauens are of two sorts; either Generall or Speciall.

Generall, I call such as are abstracted from any speciall qualitie, or condition of the Earth, or any place in the Earth. These accidents concerne either the Sunation of the Inhabitants, or the Division of the places; both which we have handled in our Sphericall part of Geographie: The Speciall are such as concerne the nature of the place in respect of the Heavens, not Absolutely, but Respecting some special qualities or properties depending on such situation; which more properly belongs to this part: For the vasolding of which, before wee descend to particularities, we will premise this one generall Theoreme.

regard of the Heavens, are diversly affected

in quality and constitution.

This Proposition needs no proofe, as being grounded on ordivary experience : for who findes not betwixt the North and the South, a manifest difference of heat and cold, moisture and drough, with other qualities thereon depending, as well in the temper of the foyle it felfe, as the naturall disposition of the inhabitants. Only three points will here require an expesition: First, by what Meanes and instruments the Heavens may bee faid to worke on the Earth. Secondly, how farre this operation of the Heavens on the Earth may extend, and what limits it may fuffer. Thirdly, how these operations are distinguished one from the other. Concerning the first, we are taught by our ordinary Philosophers, that the Heauens woske on inferiour bodies by three instruments, to wit, Light, Motion, and Influence. By Light, as by an instrumentall agent, it ingendreth heat in the Aire and Earth; not that the light being in a fort an Immateriall qualitie, can immediatly of it felfe produce heat, being materiall and elementary; But by attrition and rarefaction, whereby the parts of the aire being made thinner, approach neerer to the nature of fire, and so conceaue heat. This is againe performed two waies: either by a fimple or copounded beame. The simple Ray is weaker: The compounded inferring a doubling of the Ray by Reflection, is stronger and of more

more validitie in the operation : and by confequence fo much the more copious in the production of heat, by how much more the reflection is greater : if wee meerely confider it in reand of the Heauens, without any confideration of the quality of the Earth. By motion the heavens may exercise their operation on the Earth two waies. First, by attenuating and rarefying the vaper part of the Aire next adioining, turning it into Fire (as some Philosophers would have it) whence the interiour parts of the aire communicating in this affection must needs partake some degrees of heat; But this I hold to bee a conceit grounded only vpon Aristotles authority; who supposed the heavens to be a solid compact body: which will not To soone be granted of many of our moderne Mathematicians. Secondly, the heavenly bodies may be faid to worke on inferiour things by motion; in that by motion they are divertly difpoled and ordered to diverse Aspects and configurations of the Starres and Planers, whereby they may produce diverse effects: fo that in this fente the heavens are imagined as a difponent cause, which doth not so much produce the effects themsclues as vary the operation. Hereon is grounded all Astrologie, as that which out of diverse aspects and combinations of the Planets and Signes foresheweth diverse events. The third Instrument, by which the Heavens are faid to worke, is the heavenly influence; which is a hidden and fecret qualitie not fubiect to fense, but only known and found out by the effects. This third agent being by fome questioned, would hardly bee beleeved; but that a necessity in nature constraines it. For many effects are found in inferiour bodies, cauled by the heavens, which can no way be ascribed to the Light or Motion. As for example, the production of Mettals in the bowels of the carth. the Ebbing and Flowing of the Sea; whereof neither the one or the other can challenge any great interest in the Light: Forasmuch as the former is farre remote from the Sunne-beames: the other ceaseth not to moue in his channell, when the Sunne and Moone are both under the Earth. Befides, who can give a reason of the excesse of heat in the Canicular or Dog-dies, if he exclude this influence? For if wee confider the Light of the Sunne

Sunne, we shall finde it greater at the time of the Solfice; the reflection being greater approaching neerer to right Angles. If we confider the Earth, we shall finde no reason at all, why the heat should be more predominant at this time the an other. Then must we of necessity ascribe it to a special Influence of the Dog-frare being in conjunction with the Sunne. Many other Initances might be here produced, but I hold it needleffe, being a matter confented to amongst most Philosophers. The fecond point concernes the Extent and limitation of this operation in inferiour bodies: for vnfolding of which point, wee must knowe that this operation may have respect either to the Elements of Earth and Aire, or elfe to the Inhabitants reliding on the Earth. For the operation of the Heauens upon the Elementary maffe, experience it felfe will warrant; yet with this limitation, that this operation is measured and squared accepding to the matter whereinto it is receased; as for example, we shall finde the Moone more operative & predominant in mouft Bodies, then in others, partaking leffe of this quality. Likewife the heat caused by the Sunne more feruent where it meets with a subject which is more capable. Whence it comes to passe that on: Country is found hotter then another, although fusiect to the same Latitude in respect of the Heavens: for howfoeuer the action of the Heauens be alwaies the fame and vniforme in respect of the Heaven it selfe, yet must the same bee measured and limited according to the subject into which it is imprest. For the Inhabitants, wee are to diffinguish in them a twofold nature: the one Materiall as partaking of the Elements, whereof enery mixt body is compounded. The other fpirituall, as that of the Soule. The former wee cannot exempt from the operation of the Heauens: forafmuch as enery Phylitian can tell how much the humours and parts of our body are flirred by celestiall-influence, especially by the Moone, accordiag to whose changes our boaies daily undergoe an alteration. For the humane foule, how farre it is governed by the stars is a matter of great confequence; yet may wee in some fort cleere the doubt by this one diffinction. The Heauens may be feid to have an operation upon the foule two manner of waies. Fuft.

Fira, Immediatly by it selfe. Secondly, Mediately by the homours and corporeallorganes, whereof the Soul's operation depends. The first we absolutely deny; for the soule being an immateriall substance, cannot be wrought vpon by a material agent, as Philosophers affirme: for the second, it may be granted without any abfurditie: For the operation of the foule depends meerely en materiall and corporeall organes. The Elementary matter, whereof these organes confist, are subject to the operation of the Heauens, as my other Elementary matter. So that we may affirme the Heavens in fome fort to governe mens mindes and dispositions, so farre forth as they depend y, on the bodily instruments. But here we must note by the way, that it is one thing to inferre a Necessary; another thing to give an Inclination. The former we cannot absolutely aver; for almuch as mans will, which is the commandresse of his actions is absolutely free not subject to any naturall necessity, or externall coaction. Yet can we not deny a cer aine inclination; foraf nuch as the foule of a man is too much indulgent voto the body, by whose motion it is rather perswaded then commanded. The third point we have in hand, is to shew how many waies the Heauens by their operation can affect & dispose a place on the Earth. Here we must note that the operation of the Heauens in the Earth is twofold; either ordinary or extraordinary. The ordinary is againe twofold; either variable or Invariable. The variable I call that which is varied according to the feafon, as when the Sunne by his increase or decrease of heat, produceth Summer or Winter, Spring, or Autumne: which operation depends from the motion of the Sunne in his Eclipticke line, wherein he comes formetimes neerer vnto vs, fonictimes goeth fetther from our verticall point. The Invariable, I call that, whereby the same places are supposed to injoy the fame temperament of heat or cold without any fenfible difference in respect of the Heavens; putting aside other causes and circumstances; for howsoever every Region is subject to their foure changes, to wit, Summer, Winter, Spring, and Autumne: yet may the fame place injoy the fame temperament of Summer & Winter one years as it doth another without any great alte ations

alteration; and this depends from the fituation of any place neerer or farther of in respect of the Aquinottiall circle. The Extraordinary operation of the Heanens depends from some extraordinary combination or concurse of Planets particularly affecting some speciall place; whence the cause may be probably shewed why some place should some yeares prooue extraordinary fruitfull, other times degenerate againe to barrenmesse: or why it should sometimes be molested with too much drouth, and other times with too much moisture. To let passe the other considerations as more appertaining to an Aftreloger then a Geographer, we will here only fasten on the Invariable operation of the Heauens on earthly places; and fearth how farre forth the places of the Earth are varied in their Temper and Quality, according to their diverse fituations, and respect to the Equinoctiall circle; taking only notice of the Diurnall and ordinary motion of the Sunne in his course. Herein shall we finde no small varietie, not only in the temper of the Ayre, but also in the disposition and complection of the Inhabitants: both which we shall more specially declare: the former in this Chapter; the other in due place: wherein we shall have occasion to treat of the materiall constitution and manners of diverse Nations.

2 In respect of the Heavens, a place may bee divided two waies: First, into the North & South. Secondly, into the East and West.

Any place is said to be Northerne which lyeth betwixt the Equatour and the Articke Pole. Southerne, betwixt the Equatour and the Antarticke-Pole.

The whole Globe of the Earth (as we have formerly taught) is divided by the Equatour into two Hemispheares; whereof the one is called Northerne, lying towards the Northerne or Arcticke Pole: the other towards the other Pole is called the

Southerne. But here to cleere all doubt, wee must vnderstand that a place may be said to bee Northerne or Southerne two manner of waies: either Absolutely or Respectively: Absolutely Northerne and Southerne places are tearmed, when they are situated in the Northerne or Southerne Hemispheares, as wee have taught in this Definition; But such as are Respectively Northerne, may be understood of such Regions, whereof the one is situate neerer the Pole, the other neerer the Aquatour. In the first place here we are to consider a place as it is absolutely taken to be either North or South: Concerning which wee will particularly note these two Theorems.

Northerne and Southerne places alike fituate, generally inioy a like diffosition.

We have formerly granted to every Region or Country a speciall quality or temper: although lying or fituate under the fame Latitude. But here excluding all concurrent causes which may vary the temper of the Soile, wee confider the disposition of a place to farre forth as it depends on the Heavenly Influence or operation. In which fense we cannot deny to a place of like fite, alike nature, for as Philosophers vse to speake, Simile qua simile semper aptum natum est simile produceres Like causes alwaies produce like effects: fo the Heauens in like diftance, being disposed alike as well in regard of Light as Influence, cannot but affect those parts of the Earth in the selfe same manner. For the Instruments by which the heavens worke on inferiour bodies (as we have shewed) are Light and Influence. For both the Light and Influence, it is certaine that in places of aquall Latitude and respect to the Aquatour, it is cast æqually: both the one and the other being imagined to be carried in direct lines or beames, which with the Horizon makes like Angles. Now that the validity or weaknes of the operative Raies is to be judged according to the Right or Oblique incidency, making right or oblique Angles, no Mathematician will gaine fay. But here we must note by the way, that we only consider the Heauen according to his general! Influence or operationdepending chiefly on the Sunne: not of the speciall operation

of speciall Starres, for it may be some particular constellations in the Northerne Hemispheare may bee indowed with some speciall influence, which is not found in the Southerne; or the South in this kinde goe beyond the North. But this kinde of Influence is rare and hard to finde, by reason of the various mixture of diverfe conftellations in their operation in the fame subject: and how socuer it were well knowne, yet it is not so notable to take place before this common Rule, which wee shall finde to take place, if not exactly, yet commonly through out the whole Terrestrial Spheare. Thus Bodin shewes a great likenesse betwixt the higher Germany, and the kingdome of the Pantagones, in the South part of America, out of the great Sta. ture of the inhabitants, which must needs proceed out of the nature of the places, which are found to be fituate very necre vnder the same Parallell. The like correspondency have we noted betwixt Guinea in Africke and that part (as it is thought) of the South Continent, which they have for this cause tearmed Nova Guinea: many more Parallells in this kinde might bee found out; but these may suffice in so euident a matter.

2 The Northerne Hemsspheare is the Masculine, the Southerne the Fæminine part of the Earth.

It hath beene a vsuall kinde of speech amongst men to tearme such things as are stronger, worthier, or greater, Masculmer on the contrary side such things Faminine as are found desicient and wanting in these perfections: by which kinde of Metaphor taken from the Sexes in living creatures they have ascribed to the Northerne Hemispheare a Masculine Temper in respect of the Southerne, which comes sarre short of it: for how soever no cause can be eshewed in regard of the Heavens (as is taught in our former Propositions) except by some special constellations of the South, which is full of vncertainty, & as soon denied as affirmed; yet comes it to passe by some hidder operation of the places themselves, or at least some casual Accident or other, that these two Hemispheares suffer a great and

notable disparity. For against the large and fertill Territoryes of the Northerne Hemispheare containing in it wholy Europe and Asia, with the greatest part of America and Africa, wee shall finde (befides some few scattered llands) only three continents to oppole, to wit, a small part of Africke, the greatest part of America Peruana, containing in it Peru, Brafile, & the Region of the Pantagones, and the South continent called Terra Australis Incognita, and by some others, the South Indies. For the former lying neere the Cape of good hope, if we will credit the relations of our owne Merchants, we shall finde the aire by reason of heat, very distemperate, situat betwixt the Æquacour and the Tropicke of Capricorns: The land very barren, the Inhabitants; of a brutish disposition, wanting (asit were) all fense of science or religion: bearing heavy as yet the curse of Noah, the first father of that African Nation. For America Peruana we shall finde it perhaps more happie in respect of the Soyle, although little better in respect of the Inhabitants. Yet for the plentie of Gold mines, whereof they can chiefly vaunt, we shall finde it farre surmounted by the East Indies, or at least paralleled by America Mexicana, lying on this fide the Equinoctialicircle. For other commodities, as Cattle, Fruits, Herbage, Spices, Gummes, and other medicinable roots, and mineralls, leffe question can be made, as being farre inferiour to Europe, Asia, Mexicana and other Regions included within our Northerne partition. Of the third and greatest, which is the South continent, no coniecture can be well grounded, being in a manner all vnd scouered, except some small quillets on the borders of it: by which, if we may judge of all the reft, we shall almost give the same judgement, as of the other. The want of discouery in this age of ours, wherein Navigation hath beene perfected and cherished, is no small argument to prove it inferiour in commodities to other places: Neither had the flacknesse of the Spaniard given that occasion of complaint to Ferdinand de Quir, the late discouerer of some of these parts, had not the Spanish King thought such an expedicion either altogether fruitlesse, or to little purpose. For who knowes not the Spaniard to be a Nation as couctous of riches

as ambitious to pursue forraigne Soueraigntie : as such who will more willingly expose the lines of their own subjects, then loofe the least title ouer other Countries. This may bee a probable argument, that this Continent hath not as yet so well smiled on the ambition of this prowd Nation, as some other conquests. For Politicall and Martiallaffaires, how farre short it comes of our Northerne Hemispheare, I shall speake in due place, where I shall handle the naturall disposition of diverse Inhabitants according to their fituation. To finde out the true causes of this diversitie, is very difficult: To seeke a reason in some particular constellation, & Influences in the Heavens, or fome speciall dispos tion of the soyle, is too generall to give fatisfaction, and too vncertaine to inforce credulity. Yet putting these aside, I can only guesse at two reasons, which are aecidentall, yet firen thred with good probability. The first & greatelt is that bitter curse cast on Cham and his poste ity by his father Noah, which no doubt was seconded by Gods displeasure taking place in his habitation. That all these Nations forung from Cham, I dare not confidently auouch: Yet for the most part, it is probable they were of this Race. For the Africans it is out of question, as warranted by the holy Scripture: and it is not valikely that many of those Southerne people fetcht their first originall from them. The second cause may be drawne from the Industrie and labour of the Inhabitants in tillage and manuring of the ground, wherein the Southerne Inhabitant hath beene more deficient. For it is certaine out of the holy Scripture that Noahs Arke, wherein was the Seminary of mankinde, and almost all other living creatures, rested in the Northerne part of the world: whence both man and beafts beganne to be propagated toward the South, no farther then neceffity enforced : the Regions inhabited growing daily more and more populous, and (as it were) groaning to be delivered of some of her children. Hence may be inferred two consectaries. First, that the Northerne Hemispheare was inhabited sooner, and is now therefore more populous then the Southerne. Secondly, that the chiefest and principall men, which were best feated, rather chose to keepe their ancient habitation, fending fuch

fuch abroad, who could either bee best spared, or had the smallest possessions at home. Yet not with standing it cannot be imagined but they retained with them a sufficient company and more then went away. Out of which it must needs bee granted, that the Northerne halfe of the Earth being belt inhabited, should be best manured and cultured; from whence the ground must in time proue more fruitfull and commodious for habitation: for as a fruitfull Country for want of due manuring and tillage doth degenerate and wax barren, fo diverfe barren and sterill Countries have by the industrie of the Inhabitants beene brought to fertilitie, and made capable of many good commodities necessary for mans life. If I were curious to drawe arguments from the nature of the Heauens; I could alleage the Greatneffe and Multatude of Starres of the greater magnitude in our Northerne Hemispheare, wherein the Southerne is deficient, as also the longer soiourning of the Sun in our Northerne Hemispheare: but these as viccertaine causes I passe ouer. Other reasons may perchance bee found out by those who are inquisitive into the secrets of nature, to whom I leave the more exact fearth of thefe matters.

4 Either Hemispheare consisting of 90 Degrees may be divided into three parts, each

of them containing 30 Degrees.

Of these parts 30 we allot for Heat, 30 for Cold, and 30 for Temperature: whereof the former lyeth towards the Æquatour, the second towards the Pole, the third betwixt both.

The ancient Cosmographers (as weehaue shewed in our former Treatise) divided the whole Globe of the Earth into five Zones, which they supposed had also proportionally divided the Temper and disposition of the Earth. In such fort what according to the Degrees of Latitude the Heat and Cold

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should increase or diminish. Which rule of theirs had been very certaine, were there no other causes concurrent in the disposition of the Earth and Ayre, but only the Heavens. But sithence that many other concurrent caules, as we have shewed. mixe themselves with these coclessiall operations, and the experiment of Navigatours have found out a disproportion in the qualitie, in respect of the Distance, some later writers haue fought out a new partition more confonant to natural! experience. The whole Latitude of the Hemispheare confisting of go Degrees from the Equatour to the Pole, they have divided into three parts, allowing 30 Degrees toward the Aguatour to Heat; 30 Degrees towards the Pole to Cold; and the other 20 Degrees lying betwirt both to Temperature. Thefe 30 Degrees for Imagination fake they have subdivided againe. each of them into two parts containing 15 Degrees a peece: more particularly to defigne out the special disposition of each Region, lying either Northward or Southward from the Æquatour, which is the bound betwixt both Hemispheares. In the first section of 30 Degrees lying Northward from the Æquatour, we comprehend in Africke, Numidia, Nigritarum Regio, Lybia, Guinia, Nubia, Egypt, Ethiopia Superior. In Afia: Arabia, India, In sula Philippine. In America, Nona Hispania, Hispaniola, Cuba, with other parts of America Mexicana, In the other extreame section from 60 Degrees of Latitude to the Pole, we comprehend in Europe, Groenland, Island, Fri: Sand Norwey Suethland for the most part, Nova Zembla . In Alia. a great part of Scythia Orientalis. In America, Anian, Quivira with diverse other parts of the North of America Mexicana. In the middle betwixt both, betwixt 30 and 60 Degrees of Latitude we comprehend in Africa, Barbarie; in Europe, all the kingdomes except those North Provinces before named, and almost all Asia, except some places toward the South, as Arabia, India, and the Philippine Insula, formerly placed in the first Section; In like manner may we divide the Southerne Hemispheare into three Sections: In the first, from the Aguatour 30 Degrees we place in Africk Congo, Monomorapa, Madagasa car: In the Southerne Tract, Beach, & Nova Guinia, with many Ilands therevnto adioyning, as many of the Philippina Infula, with Infula Solomonis. In America, Peru, Tisnada, Brafilia, with the most part of that Regió which they call America Peruana. In the other extreame Section from 60 Degrees to the Antarctick Pole, is couched the most part of that great land scarce yet discouered, called Terra Australia Incognita. In the middle Region betwixt both, from 30 to 60 Degrees, shall we finde placed in America, the Region of the Pantagones, in the Southerne Continent, Maletur, Iavaminer, with many others. In discouering the qualities of these seuerall Sections or partitions of the earth, our chiefest discourse must be addressed to the Northerne Hemispheare, as that is more discouered and knowne amongst old and new writers; by which according to the former Proposition one may parallell the other; concerning which we will inferre these Propositions.

found somewhat Temperate; the other 15

about the Tropicks exceeding Hot.

That the Region lying under the Equatour is Temperately hor, contrary to the opinion almost of all the Ancients, hath beene in part proued heretofore, as well by reason, as experiment: for that all places by how much the neerer they approach the Equatour, by so much more should be hotter (as fome imagine) diverse instances will contradict. It is reported by Alvarez that the Abyssine Embassadour arriving at Lisbone in Portugall, was there aime fi choaked with extreame heat. Also Purquer the Germane, relates that hee hath felt the weather more hot about Dantzicke, and the Balticke Sea, then at Tholor fe in a feruent Summer. The caufe; which wee have before touched, are chiefly two. The first is, that the Sun is higher in this orbe in respect of those under the Aquatour, and moyeth more swiftly from them, spending on themonly twelve houres, whence fo great an impression of heat cannot bee made as in other places: for heat being a materiall quality, must neceffarily 46

ceffarily require some Latitude of time to be imprest into the ayre, or any other subject. From the Diminution of heat in the Region must the ayre needs receaue into it selse the contrary qualitie of cold. An argument of cold may bee drawne from the testimony of Alvarez; who affirmes the waters there in the month of lune, to be frozen ouer with Ice, the Southwinde blowing. The second cause is by judicious writers, ascribed to the subtilty and rarity of the Aire under the Equinoctiall line. which cannot receaucinto it selfe so many degrees of heat as the thick and groffe aire of divers places distant. For the North Region, wherein Europe, and a great part of Afiais placed, is for the most part full of waters, which bursting out of secret & vnknowne concauities, doe produce infinite Fennes, Bogges, Lakes, and Marishes, which in the Summer season cause infinite vapours to abound, which being intermixed with heat, fcorch and heat more feruently then the purer ayre of Africke, being for the most part free from the mixture and concurse of such flimie vapours. That the aire being thickned should yeeld a greater feruour, euery man out of ordinary experience can frame to himselfe an argument: For wee see Fire and Heat being incorporated (as it were) in the Steele or Iron, to burne and heat more then in Aire or Wood, The like reason some would drawe from the keepers of Stoues or Hot-houses, which doe besprinkle the ground with water, that the vapour being contracted and the aire thickned, they may the longer and better maintaine heat and spare Fuell. Another cause (which we have formerly touched) may be drawne from the Set and Anniuerwindes which blowe most part of the yeare one way. Iofephus Acosta observes that betwixt the Tropicks the winde is for the most part Easterly, beyond Westerly : and a Dutch discoverer hath related that in Guinea they have a certaine winde which comes from the land till noone; and then very violent from the Sea, infomuch as the Inhabitants are wont to traffick in the morning being not able to indure it : which if it bee true we cannot imagine this Region to be so hot as men suppose. For here the heat in the night is affwaged, by the absence or remoteneffe of the Sunne: Likewise the excesse of heat incident

to nooneride, is much qualified (or as it should seeme by this relation) altogether vanquished by the cold winde derined from the Sea. Another reason no lesse probable may be derived from the excelline he ght of the land and great mountains, obscreed to be neere or vader the line, whose tops are always coveied with Snow, may give a fufficient testimony of cold. For instance, wee need goe no farther then the ridge of the mountaines Andi in America, where they oble ued the Avre to bee fo thinne and cold, that it inforced them to fcowre and vomit, which came nere it. The like w' ereof is related of a nother called Punas, where the extremitie of cold cutteth off their hands: From which experience we may finde some places neere the Line to be more infested with cold then heat. The last and greatest reason may bee taken from the continual moissure wherewith the regions situate betwixt the Tropicks frequently abound. This moisture is derived from two causes: I from the melting of the Snow on the tops of the mountaines by the Sunne, which running from thence continually into the vallies, keepe them almost alwaies watrish, especially in the midst of Summer when the Sunne is neereft. 2 From the extreame heas of the Sunne, which being very neere, and many times verricall, raiseth vp continually moist vapours in great quantitie. These vapours in so short a time as 12 hours, being not confumed, but meeting with the cold from the middle Region of the aire, are therewith converted into drops, which fall downe againe in great showres: infomuch as some trauellers of good credit have told me, that all the while they fayled betwixt the Tropicks, they seldome saw the Sunne, by reason of rame and clowdy vapours. Whence wee note with lofephas Acofta, by way of confectary, that the presence of the Sunne betwixt the Tropicks produceth moisture, but contrariwise without the Tropicks, it is the cause of drouth: whence the inhabitats injuy as it were a Winter, when the Sun is to them verticall, because of the diftemperature by Windes, Raines, and Stormes, and great Inundations, wherevnto commonly all great rivers betwixt the Tropickes are most subjects Also they seeme to haue a Summer, when the Sunne is in or neere the Tropicks becaule.

because being somewhat removed, he cannot be so powerfull in drawing fuch store of vapours and exhalations which he can dispell and consume. Thus wee see the moity of this first 'e-Aion lying 15 degrees from the Aguatour, howfoever fubiect to a greater reflection of the Sunne-beames, yet through the concurrence of other causes to be found indifferently Temperate, and the other 15 degrees about the Tropicks, howfoever subject to a lesser Reflection to be excessive hot : which later caule, besides all which hath beene sai I before, shall bee further confirmed hereafter by the complection of the native. Inhabitants, which we shall finde to be Choller-adust, the true lymptome of an externall heat. But if any man shall answere that this accident is incident as well to the Regions fituate vnder the Equatour, as to that vnder the Tropicks; I will produce another reason drawne from the colour of their countenances; which under the Equatout is not seene so blacke and fwartie as elfewhere. For toward the Tropicke, is placed the Land of Blackmores, or Nigritarum Regio, where the people are all coleblacke: which might perhaps happen also to those that dwell under the other Tropick; but that other causes interpole themselves, which hinder the excesse of heat, which is taken to be the chiefe cause of this blacknes; Here some would oppose the opinion of Herodorus, which referred the cause of this blacknesse in the Negroes, to the Seed which hee would have to be black: others would have this blacknesse as a curse inflicted upon Charss posterity: but these opinions carry very little flew of probability. For first, if this former opinion were admitted, it would of necessitie follow (taith Fodin) that Athiopians in Scythia should alwaies be borne blacke, and Scythians in Ethiopia should be alwaies white. Forsimuch as all nations from the beginning of the world have beene confused and mixt by the distraction of Colonies: but experience teacheth vs, that men transplanted into another Soyle, will in manper of trees and Plants by little and little degenerate & change their first disposition. As if a Elackmore marry and beget children here with vs in England, experience will plainely declare the children to be more inclining to whitenesse then the fathers

and the grand children more then them. Secondly, if the second opinion of Chams curfe dele ued any ciedit; I fee no reason why all his pofferity (fuch as by most writers confert, are cenerally the people of Africke) should not bee subject to the fame execration, as well as one little parcell of ir. Moreover it is reported by Plinie, and confirmed by Appian, that in those places are many blacke Lions, which wee can afente to no othereause then the excesse of heat, and not to any quality of the Seed, or any curse in flicted on the place. Moreover it is reported by Ferdmando de Quir in his late difcouring of t'e South Continent, that he there also found fome black people; yet can we not imagine this Land, though fireteling very farre in quantity toward the Equipoctiall, to come to farre or much farther then the Tropick of Capricorne, These arguments make it the more probable that the Regions fituate voder the Tropicks, generally exceed more in hear, then those placed in the middle of the Earth under the Line.

2 In the other extreame Section from 60 Degrees towards the Pole, the first 15 Degrees towards the Equatour are more moderatly cold; the other towards the Pole most immoderately cold, and mast for convenient Habitation.

That this Section of 30 Degrees comprehended betwixt the 60 Degree and the Pole, is in a fort habitable, is confirmed by the testimony of many Navigatours, especially the English and Hollanders; who have adventured very farre Northward, and have there found the Earth, though not so fruitfull, yet surnished with some commodities, and peopled with Inhabitants. The first 15 Degrees towards the Equator admit of no great, exception, containing in their extent Finmarke, Todia in Scandia, Nova Zembla, Anian, Groenland, with many other places indifferently discovered: where they have indeed found the aire very cold in regard of this of ours: Yet not so Immoderate, but

but that it can at all times agree with the naturall temper of the native Inhabitants, and at least at some times of the yeare admit a passage for forraigne Nations. But the other Region Aretching Northward from 75 Degrees to the Pole it lelle, howfocuer it may be probably thought habitable, yet affords it no convenient meanes and fustenance for mans lite, in respect of other places; neither can the people of this climate injoy any good complection or Temperament of the foure qualities; forassuch as the cold with them is so predominant, that it choaketh, and almost extinguisheth the naturall heat; whence Hypocrates faith that they are dried vp, which is a cause of their fwarty colour, and dwarfish stature; which affertion of his can obtain no credit, but of fuch Northren people as live neere the Pole; Nevertheleffe wee shall not finde these poore Northernemations, so destitute altogether of vitall aides, but that their wants are in some fort recompensed by the benefit of nature. The chiefest comforts in this kinde, which we injoy, and they sceme to want, are Heat and Light. The defect of heat is somewhat mollified; I By the Sunflaying so long about their Horizon as 6 months, and by confequence impressing into the Aire a greater Degree of hear. z. By the natural custome of the Inhabitants, neuer acquainted with any other temperature: both which reasons we have formerly alleaged. 3 By the industrie of the Inhabitants, being taught by necessity to preferue themselves during the Winter time in Caues, Stones, and fuch like places heated with continuall fires: the defect of which providence, was thought to be the ruine of St Hugh Willoughby, intending a fearch of the North east passage on the North of Lapland and Ruffia. To recompense the desect of Light, Nature hath provided two waies: I In that the Sunne in his Parallell comming neerer and neerer to the Horizon, giues them a long time of glimmering light both before his rifing & after his fetting: which may ferue them infleed of day, 2 For that the Sunne and Starres by reason of a refraction, in a vaporous and foggie Horizon, appeares to them sometime before he is truly rilen: web caused the Hollanders in Nova Zembla, to wonder why they should see the Sunne diverse daies before according cording to their account be was to rife about their Horizon according to Aftronomicall grounds: which probleme had flaggered all the Mathematicians of the world, had not the Per-Ipective science stept in to give an answere.

Je the middle Section betwirt 30 and 60 Degrees of Latitude, the first 15 are Temperately Hot, the other 15 more inclined to Cold.

The middle Region partakes a mixture of both extreames, towit of the cold Region towards the Pole, and the hot towards the Æquatour; whence it must needs follow, that the more any parts of this Tract approach the hot Regió vinder the Tropicke and Aguatour, the more it must partake of Heat : yet this heat being mittigated by some cold by reason of the fire of the Sun, it must of necessity be Temperate and very apt for huma e habitatio. Also this mixture of the coldquality being more extended and increased on the other moity towards the Pole through the vicinity of the cold Region, must loofe much of the former hear, which shall hereafter be more confirmed out of the natural constitution & complection of the Inhabitants; bearing the true markes of externall cold and internal Hear, whereof the one is strengthned by the other: For the external cold if it be not ouer predominant, and too much for the internall Heat, will by an Antiperistasis keepe in & condensate this hear, making it more feruent and vigorous.

of The East & West Hemispheares are bounded and divided by the Meridian passing by the Canaries and the Molucco Ilands.

7 The East Hemispheare reacheth from the Canaries to the Moluccoes on this side; as the other on the opposite part of the Spheare.

G 2

We may here note a great difference bet wixt this diulifion and the former. For the North and South Hemispheares being divided by the Æquatour, are parted (as it were) by Nature it fel'e, and the Sunnes motion; But the diulifion of the Globe into East and West, we can ascribe to no other cause, then mans Institution; yet are the Easterne and the Westerne found to differ many waies, the discouery of which may give great light to observation.

is every way happier and worthier then the other Westward.

How far short the Westerne Hemispheare comes of this of ours, many circumftances may declare. For first, if we compare the Quantitie of Land, we shall finde a great disparitie. For the Westerne Hemispheare containes in it besides the Southerne Continent (wherein ours also claimes a moity) only America, with the Ilands therevnto adjoyning: whereas the other within this large circuit containes all the other parts of the Earth knowne vnto the Ancients, as Europe, Afia, and Africke, with many Hands to them annexed. Moreover it is probably conjectured by some, that America is viually on our Mapps and Globes, especially the more ancient, painted and delineated out greater then indeed it is: which hath been afcribed to the fraudulent deceit of the Portugalls heretofore; who to the end they might reduce the Molucco Hands to the East Indies, then their owne possession; sought as well in their Mapps as relations to curtaile Afa, and inlarge America in fuch fort, as the Melucco Hands might feeme to fall within the 180 Degrees Eaftward, wherein they fed themselves with voknowne substance, and the Caffelians with painted fragiowes. But to let passe the quantity as a matter of leffe moment and leffe questioned; a great disparitie will be found in the Qualitie and Disposition: For what one commodity almost was over found in this Continent, which is not only parallelled, but furmounted by this our Hemitpheare? If we compare the Mines of Gold & Silver wherein confilts the wealth and riches of both places; our East Indies

Indies will eafily challenge the Superiority. If Trees, Plants, Herbage, & Graines, let our Physicians & Apothecaries judge, who owe most of these medicinable drugges to India: Let our Merchants answere, which owe their Spices to Arabia, their Wines to Spaine Italy, the Mediterranean, Gracian, & Indian Hands; their Silkes, Linnen, Cloathing, and their furniture almost wholy to Europe. If we compare the multirude and various kindes of Beafts bred and nourished in either place, no question but Europe, Afra, and Africa can shew farre greater Heards of Sheepe, Cartle, and fuch like, with farre greater variery of kindes, then ener were found in this new found Continent. It all these fayled, yet the well tempered disposition of the Europeans and Afrans in respect of this barbarous and vinurtured place, disdaines all comparison; where we shall observe en the one fide a people long fince reduced to civility, infructed as well in liberall sciences, as handy-crasts, armed with martiall discipline, order'd by Lawes and civill government, bound with a conscience and sense of Religion; on the other fide a multitude of miserable and wretched nations, as farre diflant from vs in civility, as place; wanting not only government, Arts, Religion, and fuch helps, but also the defire, being lenseleffe of their owne mile y.

2 The difference of East and West cannot work a diversitie in two places by any diversity of the Heavens.

East and wist places compared together, are either of aqualt or voraquell Latitude. For places of voraquall Latitude to question can be emade, but they recease a greater variety of Temper from the Heasens; as we have formerly proved but this disparity growes not out of the discripty of East & West, but the distance of North and South. But that places alike situate in Latitude, cannot vary by any discript of the heatens is plainer for a simple the same out any discription wherefore, if any such discriptive we want place found, we ought not to seeke the cause thereof in the heatens.

vens, but rather in the condition of the Earth it selse, which no question suffers in diverse places of the same Latitude a great

Yariety.

8 Either Hemispheare may againe Respectively be subdivided into the West or East. The West in this our Hemispheare I call that which is neerer the Canary Ilands; the East that which lieth towards the Molucco Ilands; to which points there are others correspondent in the other Hemispheare.

I Places situate towards the East in the same Latitude, are hotter then those which are

placed towards the West.

For the explanation of this Theoreme, we are to examine two matters; First, what probability may induce vs to beleeue the East to bee hotter temper then the West. Secondly, what should be the cause of this divertitie in both places, being supposed æqually affected, in respect of the Heavens: for confirmation of the former, many reasons have beene alleaged of old and late writers. It is agreed on (faith Bodin) with a joint confent of the Hebrewes, Greeks, and Latines, that the East is better tempered then the West: which hee labours to confirme; First, out of many speeches of Ezekiell, Esay, & the other Prophets, where the East seemes to challenge a dignitie & prerogative above the Well; which betokeneth (as he imagines) a bleffing of the one about the other. But I dare not venter on this Interpretation without a farther warrant. Secondly, we may here produce the restimony of 'Flow in his feventh booke, where he affirmes that by ordinary observation, it is found that the peltilence commonly is carried from the East into the West, which Bodin testifies himselfe to have foud by experience in Gallia Narbonensis, and many other historie feems

sceme to iustifie. Amianus a Grecke Author, observes that Seleucia being taken, and a certaine porch of the Temple being o en d, wherein were shut certaine secret myst ries of the Chaldeans; that a fuddaine contagion arose of incarable diseafes, which in the time of Marcus and Verus from the farthermost ends of Perfia, spread it felle as faire as the R bene and France, and filled all the way with heapes of carkaffes. If at any time the concagion be observed to be carried another way. an univerfall peltilence is feared; as according to the histories there happened not long after from Athiopia towards the North, which infested the greatest part of the world. A third proofe may be drawne from the tellimony of Ariffotle, Hipporrates, Gallen, Crefias, and other grave Authors, who affirme that all things are bred better and fairer in Afia then in Europe, which must needs argue a better temperature: To back which Testimonies, we need goe no farther then moderne observation. Every Geographer will tell you how farre in fertility Natolia in Aha surmounts Spaine; and China, under the same Latitude exceeds both: who knowes not how farre Fez and Morocco on the Westerne Verge of Africa, stand inferiour to Egypt, a most fruitfull and happy Region? And how farre short both these come of India, brugte in the same Climate. An argument of greater heat in the Eafferne place; may be the multitude of Gold and Silver mines, Spices, & other fuch like commodities, wherein Afia much excells Europe: whereas such mettals and commodities as require not fo great a measure of heat in their concoctio, are rat er found in Europe then in Afra: whence there feemes to arife a certaine correspondency of the East with the South, and the West with the North. The greatelt reason of all is taken from the Temper and naturall dispofition of the Inhabitants, for a funch as the European refembling the Northerne men, thewes all the Symptomes of inward heat strengthned with external cold. The A staticke followes the difroficion of the Southern man, whose inward hear is exhausted by externall fee ching of the Sunne-beames, & therefore partakes more of Choller-adult or melancholy. But this point we shall more fully prosecute in due place. To shew a cause of this yaricty

variety is very difficult. Those which in wit and learning have farre exceeded my poore scantling, have herein rather confesfed their owne ignorance, then addentured their judgement. It were enough to fatisfie an ingenuous minde, to believe that Almighty God was pleased in the first creation of the world to endow the Eafterne part of the Farth with a better temper of the Soyle, from whence all the rest derive their originall: which seemes not improbable, in that he made Asia the first resting place of man after the Creation, the tecond Seminary of mankinde after the Deluge, the only place of our Sa. viours Incarnation. In this matter I beleeue no leffe, and can speake no more, except I should vrge the beating of the great Atlanticke Ocean vpon our Westerne shoares; which may in some fort qualifie the excesse of heat incident to the Easterne tract, which may produce son e degrees of Temperature. But here allo we shall perhaps meet with crosse instances, which will flirre vp more doubt then fatisfaction.

CHAP. IV.

Of the manner of Expression and Description of Regions.

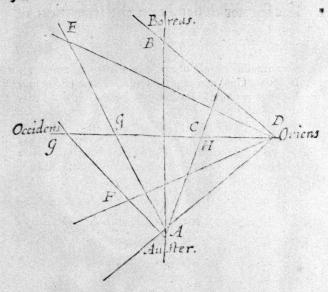
Auing treated of the general! Adiuncts of places, wee are next to handle the manner of describing a Region, which proposeth vnto vs two points, I the finding out the Position of two places, one in regard of the other. 2 The Translation of such places so found out into the Globe or Charte. 2 The

2 The former depends on the invention of the Angle of Position by some Dioptricke Instrument.

This maner of descriptio of a particular Region, seemes very necessary for a Geographer, which every Mechanician may soon learne & practice. Many instruments have bin devised by curious Artificers for this purpose: whose viehath bin set out largely by later writers, as by Gemma Frisius, Diggs, Hopton, and others; to whom my reader may have recourse, because I hold it not my taske in this subject to describe the Instruments themselves; but briefly to shew the ground and vie of them; which these propositions shall expresse.

Diverse places observed at two or more Stations, by some Dioptrick Instrument, the situation of two places, one in regard of the other, may be found out and expressed in a Plaine.

This may lenfibly be shewed in the Figure following: to expresse which the more plainly, we will set downe these Rules: 1 Let there be drawne in some Chart or plaine platforme, a right line, which we must a compt to be our Meridian; becauseit shall afterward serue for that purpose. right line shalbe AB, whose two ends A and B shalbe taken for the North and South. 2 You must choose out some high place, as a Towre or Mountaine, from whence you may behold fuch cities, townes, caltles, and other fuch notal le places whereof you defire to know the fituation and bearing of the one to the other: This High place is called the First Station; where you must place the plaine before prepared in such fort, as it may Aftronomically and cruly agree with the true Meridian of the place (whose invention we have taught in the first Booke) and for espect the source Cardinal coasts, to wit, East, West, North, and South; Vpon this place seated in such a man-



ner of fituation fasten your Dioperick Instrument, that it may be turned about the point A on every side at pleasure, in such fort, as the sight may be directed to every one of the adjacent places. First then removing it from A, direct your sight to F, and draw the sine A F of indefinite length: likewise your Instrument being directed to G, draw the line A G infinitely, which by this meanes will also hit the place E: Let B also be imagined a certaine place, as a City, or Castle, situate in the very Meridian it selte, which we find already drawne to our hands. In like fort ought we to proceede with the other places C and D, and as many as we please.

This performed, you must remove your selfe with your Infrument and Plaine to some one of these places thus fore-marked out, as for example vnto D, which is called the second station, and there as in the former, ascending vp some high place,
the Plaine being first fitted and placed Astronomically, take

the Distance AD of any length what soeuer; for to the greatneffe of this Diffance, shall all the rest bee proportionall. Hence to place your Dioptrick Instrument at the place D, that it may be turned round, and directed to all those places formerly observed. In this fort levelling your fight to the place or caftle F, draw the line D F: fo directing your fight to the rest, you may draw the lines DCG, DE, DB, &c: Now by the points of Interfections of thefe lines, as in F.G. E.C.B. &ceare to bee defembed and delineated out the faid notable landmarkes, as Cities, Townes, Caftles, Promintories, and fuch like. Betwixt these places if any man defire to know the distance in miles, he may know it by finding out any one of these Diftances; for one being knowne, the rest will also bee exactly knowne: as for example, we will imagine the Distance AD to containe to miles: wherefore let the line AD be divided into 10 a quall parts: then with your compasse examine how many fueh parts are contained in the Distance A F, for so many miles will be likewise in it contained: as for example according to this supposition we shall find it ; parts: wherefore the castle or city F wilbe q miles distant from the city A. He that defires more particularly to acquaint himselfe with the vie and diverse manners of descriptions of Regions, deriued from this one ground; Let him have recourse to diverse Authors who have particularly laboured in this subject; amogst which our two Englishmen, Digges, and Hopson, deserve not the least praise: whereof the later, out of these principles hath framed a curious Instrument, which he call's his Topographieall Glaffe, whose vie he hath perspicuously and exactly taught in diverse pleasant conclusions, too large for the scope of my methode to infert.

2 At one Station by optical observation, the station of one place in respect of the other, may be found out.

This may be shewed out of an opticall experiment, both pleasant & admirable: The ground is expressed in this proposition.

H 2

ficion: The light traietted by a narrow bale into a darke place will represent in any Table or white paper within, what loeser is with. out directly opposed unto it: For demonstration of which propolition, we mult take as granted of the perspelline Authors. That the visuall Image or species will passe by a right line through any licle hole, & wilbe terminated in any point of the Medium: Now that it should more perspicuously be seen in a darke place, t'en in the light. The cause is assigned to be be. cause the light of the Sun is taken away, or much diminished. which otherwife would hide and shadow the frecies of the thing which is presented to the fight; as we see by experience the greater light of the Sun to obleure the Scarres: which noverthelesse from the darke bottome of a deepe Well or Aline, will shew themselves at mid-day. Neverthelesse we must obferue by the way, that this representation of any thing to the fight by this Image impressed in this fort in a wall or paper, will shew it selfe so, as the parts will be seene inverted, or (as we may fay) turned on the contrary fide: as the higher lower; the lower, higher; the right-fide, to the left; and the left, to the right: which we may declare by an ocular demonstratio in el is

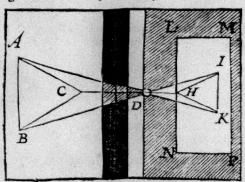


figure heere nterted: Let vs imagine a Triangular platforme of land, where-of we defire to know the fituation, to be A B C: from the extreame Angles of this Triangle.

we will suppose certaine Rayes to be drawne through the hole D into a darke place, wherein shall be opposed to the hole D, a white Table or paper, which shall be N M: Here wil

a Ray from the point defigning out the Angle at A, be earried through the hole, that it will point out in the Table K. (because all such beames according to the Opticks are right lines.) Likewie the Angle B will in the Table deligne out the Point I: allo C will fall into the point H: Let K H, I K, H I, be loyned together by right lines, there will appeare the Triangle IKH: wherein the top of the Triangle A will be feene in the lowest place K: Likewise the Angles of the Basis B and C, will appeare in the points of the highest place H I: and the right fide AC, will show it selfe in the left HK: as the left fide will be the right in I H: wherefore the fide of the whole Triangle A B C will shew it selfe in the Table N M, although inverfely placed according to the fides and Angles; and of a various greatnesse in refnect of the distance of the Table from the hole. This invention hath great vie in Astronomy, in observing Eclipses, the beginning, end, & continuance, without any hurt at all to the fight. No leffe vie may it challenge in Top graphy in describing of Territoryes, Citties, Borrowes, Castles, and such like, in their due symmetry and proportion: To practife which the better, Reniner would have a little house built of light Timber, with a Multangle Basis: in every one of whose sides, a hole should be made, looking inwardly, at the vertex, or top, but outwardly at the Basu: through which the species or Image of all fuch things as are visible may have free passage:

2 The manner of translation of a Region into the chart, depends from the knowledge

of the Longitude and Latitude.

The parts to be described, whereof the chartconsists, are either Essentiall, or Accidentall: The Essentiall, are either the Lines, as are the Meridians and Parallels: or the Places to be delineated out by Pictures;

H 3 The

The delineation of both which, shall be taught in these rules.

To set downe, the Meridians and Parallels in a particular chart.

To show the practise hereof, we will take for instance the Region of France, an exam, le familiar with our later Topagraphers, and therefore can better warrant the description: France is supposed to have in latitude to. degrees, in longitude 16: This knowne, you must proceede in this manner: First through the middle of your table from head to foote, let there be drawne a perpendicular line expressing the Meridian of the world, which shall be marked with the letters EF: let this line be divided into 10. equall parts: then draw two Parallell lines, whereof the one must crosse the said line about the point E with right angles: and the other Parallell must crosse it againe beneath in the point F with like angles : let the vppermost Parallell be expressed by A B: The nearhermost with CD: Then with your compasse take one of the 10 parts of the line E F, which is one degree, and fet that downe apart by ir selfe, dividing the same into 60 Minutes, as the short line GH, in the table heere inferted will shew on the right hand. Now you may learne by some Table or Mappe, that the farthest part of France toward the Note, through which is drawne the Parallell AB is 52. degrees distant from the Equatour: And that the South Parallell CD, is distant 42 degrees: Also certaine Tables in our former booke will informe you, that to every degree of the Parallell 42. delineated by A B, doe answere 37 miles: and that to eucry degree of the Parallell CD, answere 45 miles: wherefore with your compasse take from the short line GH, 37 partes or Minutes, and with your compasse kept at the same largenesse, let the Parallell A B be divided into 16 zquall spaces correspondent to that widenesse (that is to say) on each side of the Meridian 8 parts: at which Meridian E F, you must beginne your measure towards either hand both right and left, marking

marking the end of every such space with a certaine point: Moreover for the South Parallell CD, let 4; parts likewife be taken from the short line GH, and let that Parallell be divided into 16 spaces, correspondent to that widenesse of the compafie, eight spaces being fer downe on each fide of the Meridian E F: So that we must beginne from the M ridian EF, and marke the end of every fuch space with a point. Then from those points wherewith each of those two Parallels AB. and C D is marked; Let there be drawne a right line from point to point, and these shall ferue for Merideins expresfing as well the longitude of the whole Region, as of every particular place therein feated. In like fort as you have divided the Aleridian E F, into 10 æquall parts, so againe into the like number of aquall parts must be divided each of the two vitermoft Meridians, on the left hand and the right, marking with a point the end of every fuch space, and so from point to point let there be drawne right lines, cutting all the Meridians, and those shall serve for Parallels, and in the vitermost spaces, let there be written the nun bers of Longitude and Latitude. The Longitude, is supposed to beginne at the vitermost Meridian at the left hand, which in both Parallels is the farthest Meridian Westward. Now for a finuch as the most Westerly Meridian is sourteene degrees dift int from the Meridian passing by the Canary Hands, from which as the first Meridian, the auncients began their accompts: you must fet downe in the first place on the left hand, as well over, as under in the first space 15, in the second 16, in the third, 17,& fo orderly proceed through all the spaces, til you come to 30: For the difference betwixt 14 and 30, is 16: So you have the whole Longitude of France expressed in your Table, which is 16 degrees: In the I ke fort to expresse the Latitudes having the degrees of Latitude marked out) you must beginne at each end of the South Farallell CD, and so proceed vpwardin the two vitermost Merid ans, writing downe in the first space at the foot of the Table 43 degrees, on the right hand and the left, in the fecond space 44, in the third 45, and so vpwards along to 52, to have you expressed the whole Lasitude

are comprehended just 10 degrees: These degrees may againe be divided at pleasure into lesser parts, as minutes, according to the largenesse of your chart.

2. To set downe Citties, Castles, Mountaines, Rivers, and such like special places in the

chart .

The platforme of your chart being once drawne out, as wee have formerly taught in the pracedent rale, you may very eafily fer downe speciall places by observation of the Longitudes or Latitudes of fuch places, either by Inft: uments or Tables, and reducing them accordingly to your chart: which we suppose before, marked out according to severall degrees: As for example, if we would fet downe in our chart the Metropolis of France, which is Paris: having recourse to my Table, I find it to have in Longitude 23 degrees, in Latitude 48 degrees. Heere to find out the faid Longitude, you must extend a threed from the 23 degrees of the Parallill A B to the like degree in the Parallell CD: then holding it fast, you must crosse that threed with another extended from the Meridian A C. to the Meridian AD in the points of 28 degrees: The point wherein these two threeds shall cut and crosse one the other, you may take from the true place of Paris, and marke it out in your chart: In like fort you may proceede with all other places. But if you were to describe a river in your chart, it will not be sufficient to take the Longitude and Latitude of the beginning or fountaine, but of the end, middle, turnings, and angles, Townes, or Cities, by which it passeth. Bridges and other occurrent circumstance : In like fort may you fet downe Woods, Forrests, Mountaines, Lakes, and other places whatfoever.

4 Thus much for the Essentiall part of the particular Chart: The Accidentall part wee call the Scale of Miles, which teacheth how

many miles are contained betwixt any two places in the Chart wherein wee are to know two things, I The Fabricke; The Vis.

The Fabricke of the Scale depends from the certaine knowledge of the Distance of any

two places in the Chart.

The practife is very easie, and taught in these three Rules: I You must fearch out the distance betwixt any two places whatforurr, which are contained in the Region, described in your Chart; which you may doe either experimentally by your owne knowledge, or some certaine relation of Trauailers. 2 Then must you draw three 'Parallell lines, containing two spaces, one larger, the other leffer, in some voide space of your Chart. 3 You must divide the said Seale into so many Miles, as the faid voide space will give you leave, according to the knowne distance first found out: As for example, the distance betwixt Paris and Roane is knowne to be 20 French leagues, which containes 60 of our Miles, allowing for every fuch league, 2 Miles. Wherefore your Parallel lines being first drawne (as you see in the following Chart) divide your Scale into 30 parts accordingly, and in the larger space, place your Numbers, 2s 10. 20.30. and fo forth, fo farre as your space will conveniently extend.

in the Chart, being taken and applyed to the (cale, will show how many miles it containes.

As for example, I would willingly know how many English Miles are contained betwixt Paris and Orleans in my Chart of France: Heere I take with my compasse the distance betwixt the said Cities in the Chart, and applying that to the Scale, I find it to containe 50 miles: which is the true measure.

CHAP. V.

Of Hydrography.

Itherto have we treated of the Generall Adjuncts & Proprieties of places in the Terrestrial! Spheare: wee are in the next place to handle the Distinction.

2 A place is generally distinguished into Water and Land: The Description of the former is termed Hydrography; The other for distinction we call Pedography.

3 Hydography is a Description of the Waster, with the Acciden stherunto beloging.

The Water we consider not here meetely I hysically, as it is an I lement, who cos mixt bodies are copounted; but Topos g. aphically, as n beares a parcin the Terrestrial Glob: yet are we not so entious to exclude such Physicall problemes & considerations as are most subject to sense; which a Topographer cannot well n glost: being the markes and characters, sensing out specials places: To finde out the originals of the Water, we must first take as granted, that Almghey God (as we reade in the first of Genelis) in the beginning made a separation between the Firmament; whereof the former is termed in the Scriptures 227, which is a simuch to say a expansion, a thing stretched out, or extended. By these waters above the Firmament, whether we ought to understand the clouse va-

pours in the middle Region of the Aire: or the pure fluid and liquid body, whereof the Firmament confifts; I leave it to learned dui es and critick expositours to dispute: although the propriety of the phrase (it to be well rendred) will seeme to favour this opinion rather then the other: for a fruch as the Are can no way be faid to be about the Firmament, except the Hebren terme miscarry in the Translation. For the foliaity of the Celeffull Orbes , which Ariftotle labours to confirme, is found long fince to thwart the obleruations of Aftronomers; although it may thus be retained as vietull supposition ons to lettle Imagination. But to let this paffe, and come to the waters under the Firmament, understood by the word = 12, which fignifies alimuch as a collection of waters: we shall find them to have taken their original from the faparation of the waters lubflance from the Dry land, caused by God in the first Creation, testified by Moses in I Gen: which once granted (25 no Christian can deny) easily repates the edge of the opinion of some auncient Philosophers, who contended, out of the nature of Drouth and Moisture, to derive The dryneffe of the Earth the beginning of this fep tration. (fay they) working by little and little, diminisheth or at least reliffeth the waters, fo that they should not altogether overwhelme the Land: But this reason is altogether deficient in Nature: Because Drouth and Mosfure are no such qualities to have fuch an operation; and if any fuch there were betwixt Drouth and Moisture, the Drouth (as we lee by experience) would rather draw moisture vnto it, then any way expell it. or drive it away: whence it is most evident, that it was effected by no other meanes then the immediate worke and prouidence of God, for the preferuation of living creatures: for, before God laid; Let the waters be gathered into one place ; the Water was faid to couer the whole face of the Earth; but afterwards at God's appointment, the water went back, and the wed the dry land. But by what meanes God feparated the one from the other, it is much controveried amongst Dinines and Philosaphers. Many were of opinion, that the Earth was fuffered to stand intire without alteration, and that the waters

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were eleuated aboue it; so that if they were suffered to flow abroad, they might againe couer the face of the Earth, as in the

beginning.

But why the Waters should be thus restrained, is not agreed among the notion for some thought, that this was done by the miraculous power of God, which refraines the flowing abroad of the Water, beyond his ordinary bounds; of which opinion is St Ierome, who grounded his opinion (as it feemes) on the authority of the Scripture, especially in the 8 of the Proverbs, and the 103 Pfalme; where God is faid to have fet a bound upon the feas, which they should not passe: But this reason seemes not warrantable; That the great Creator of all things, should in the first institution of Nature impose a perpetuali violence vpon Nature. Mmoreouer all miracles are temporary, and not perpetuall; for then were it ordinary, and so scarce a miracle: others vpon leffe ground, have imagined that there are certaine Northerne starres in Vramaior and Drace, of lo great vertue, that they can draw the Ocean from this habitable part of the earth toward the North, and so constraine the waters, that they cannot overwhelme the earth: but this opinion is rediculous, and deferues no solide refutation: being a meere coniccture, without ground or probability: orhers vpon the like reason, have dreamed that there is more water then Earth in the Globe; and that the water by his extraordinary maffe occupying the center of the world, turnes the earth on one fide, making it to Swimme as a ship vpon the fea: But this affertion we have refuted in our first Chapter of the first booke: All these Authors suppose that the earth is vncovered toward the North-Pole; but overflowne with waters towards the South: which the experience of Nauigatours at this day hath sufficiently disamulled: Others againe : ffirming out of a Peripatetical dreame that the water is ten times greater then the earth. suppose the earth to be like a sponge to drinke vp the water: to proue which affertion they produce an experiment, that the earth being digged any thing deepe in most places, there will appeare water: whence they collect that the water is mixt with

with the whole earth, and received into it's concavities : But howfocuer we may graunt, that there are many and aft concavities in the Farth, capable of Waters; yet it is impossible, that the Water should be ren times as great as the Earth: for by this reason, although all the Terrestriall Globe were Water, it could not be, but that a greater portion of Water, then that in the Earth, should arise aboue the Earth; because, accerding to their own Supposition, 9 partes should be about the Earth: Neither can Arin otles words be well wrested to this interpretation: For a much as he understood this ten-fold proportion of the Water to the Earth; not of the fpaces, which they replenished, measured by their Circles and Diameters: but of the proportio they beare one to the other in their transmutation : as that one measure of Earth turned into Water, should be asmuch as 10. All these opinions seeming so abfurd, it feemeth mere probable to imagine, that either the Waters are condensated, and thickned, which were in the beginning created thinne: whence will follow, that they should occupy a leffe place, and by confequence, leave the dry land in many places habitable; or, which is more probable; that God in the first Creation made certaine hollow concavities and channels in the Earth, which was before plaine and vniforme; into which the waters were received and bounded, infomuch, that they could not flow abroad. This feemes enough to satisfie the search of such as are not too curious to fearch into his fecrets, whof power and omnipotence tranfcends the capacity of the wifeff: In this division of a place into Water, and Land, we will first treat of the sea, and the accidents belonging therevnto: Not that the water is worthier or greater then the Earth; The contrary whereof we have proved heeretofore: but because the confideration of it, is more simple, as that wherin fewer matters are to bee handled then in the land. For Rivers and Lakes, although confifting of this watery element, we thought fit to handle apart: 25 adi incts belonging to the land.

4 In the sea are considered two things: 1 The
I 2 Adjuncts.

Adiuncts, 2 The Division. The Accidents of the sea whereof we are to treat, are either Internall, or Externall.

5 The Internall, are such as are inbred in the fea: These agains are either Absolute or

Relatiue.

6 The Absolute, are such as agree to the sea, without any comparison with the lands such are either, Figure, Quality, or Motion.

7 The figure is the conformity of the externall superficies of the Sea, whereof ob-

ferue this Theoreme.

I Although the whole body of the water be sphæricall, yet it is probable that the parts of it, incline to a Conicall figure.

That the whole Water according to it's outward Smerficier, is spharicall and round, is sufficiently demonstrated before, in the first booke. But notwithstanding this roundnesse of the whole, the parts of it may (for ought I see) admit of a Cenicall figure; for as much as this hath little or no proportion to the vast Spharicity of the Water, no more then little hils, to the greatnesse of the Earth. For the prosecution of which point, I will first shew the reason of this my conjecture, grounded on experience; and afterwards out of the ground and demonstration of the principles of Mathematicall Philosophie, endeavour to make it more manifest. First therefore by a conicall line, we understand a crooked line which differs from a Periphery or circle, in as much as it keeps not alwaies an x-quall distance, from the center; but is higher in the midst, then on either side: Now if the parts of the water standing stil, were

in their higher fuperficies exactly spharicall; they should by the fame grounds be concentricall, or have the fine center with the whole Earth: But that it hath not the iamecenter, will appeare by litle dropps of Water falling on the ground, which incline (as we fee) to a round figure; y t were it in re then ridiculous to fay, that this round convexity of a droppe could be concentricall with the whole Earth: fithin o great a maffe, it is hardly fenfible. But heere our ordinary Philosophe s are ready to answere, that this conformity of the water dropps in a round figure, is rather Violent, then Naturall: because the Water being by nature most, is ready to fly and avoid the rouch or drouth, or any dry thing. And because the Water thus avoiding the drouth, cannot of necessity but fome way touch it, it is magined to conforme it fel'e to that figure, wherein it may I aft of all touch: This is the round or Ipharicall figure; wherein any body contained, cannot touch a plaine, other wife then in one only point. But against this conicclure of mouture flying drouth, throng enough is the experiment of Scaliger, in his 105 exercitation: the quick filmer a moift substance, being cast either int Water or from lare, will gather it felfe to a round body, notwithstanding it is manifeft, that quick filner naturally neither avoides the touch of Warre or Iron, toral much as the one is very most, the other of great affinity, (as our Chimicks teach) with quick filmer, the parent of all Metrals. Moreover it is manifest that this conformity to roundnesse, is ind opps of raine falling to the Earth, through the Aire: yet will not our Periparericks admit of any drouth in the Aire, which this moult element friendd feeke to avoid. Moreover if Water should conforme it felfe to roundnesse, by reason of the drouth of the body, whereon it fal., then must it follow; that either the moisture of the Water should expell the drouth of the Earth; or effective the drouth of the Earth should worke on the most tire of the Water; But n ither can be graunted with probability. En fi because moisture & drouth are not qualities of such activity to drive and remove, one the other from one place to another, as it is here imagined: 31; if the moilt should worke on the

dry, it should either touch it or not: If it touches not, it cannot worke on it; because no Physicall action can be performed without touching befides, it were very impossible, toimagine that without this touch, one of these qualities should perceive or fent the other to avoid it. If it touch, it avoides not the touch, but lovnes it felfe with the drouth: And indeed reason and experience shewes, that drouth rather couets & drawes vnto it selfe moisture, then expels it: wherefore Scaliger goes about to forge a new cause of this experience. Enery thing (faith he) in his nature is one, and the felfe fame: But this vnity in Homogeneall bodies, is best preserved in a Globe or round figure: wherein is no inaquality, no parts higher or lower, abounding or deficient. But heere might a man aske why the greater parts of the Water are not likewife conformed vnto roundnesse, as well as the lesser droppe: He would perhaps answere, that nature in them was not in such diffresse, to make vse of this speciall priviledge; I graunt it: yet find I in this no fatilfaction; for almuch as he gives a finall cause, where I sought an efficient: for I would farther aske by what action or motion this water should gather it selfe into a circular figure, and from what forme it should arise; for first we have shewed, that this motion cannot proceed from the external drouth, we must seeke the cause in the water it selfe: heere we shall finde it, either the particular forme of the water or a certain winerfall forme, as fo ne suppose. It cannot be imagined, that it should proceed from the generall forme of the vniuer f: First, because as we have elsewhere proved, there is no fuch Internall forme of the world: Secondly, those motions are commonly ascribed to an uninerfall Nature or forme, wherein any particular body (as it were) neglects his Owne Naiure, for the preservation of the whole Vniuerse. But here water containing it felfe in an orbe, and not flowing abroad towards the Center, rather feemes to forfake the Center and Vniuerie to preserve it selfe. Whence we must neceffarily conclude, that this roundnes in drop; of water cast on the fand, proceedes not from externall drouth, nor any vninerfall forme, but from the specificall and effentiall forme of che

the water; and confequently, because it makes a circle excentricall with the Earth, it must be found rising higher in the midft: To which we will adde another experiment : Let there be cast on a large Table or planke, a litle portion or drop of water: I here aske, whither this water on the midft of the Table aquilibrated, will continually flow abroad, or at length fuffer a flay or flop? It cannot be continually foread abroad: first, because experience teacheth the contrary; for we see litle drops cast on such a plaine, to confine themselves within certaine bounds: and least any should imagine (as before) that this happens by reason of the drouth of the Table, let him first moisten the Table, and he shall find no great alteration : Secondly, if the water should alwaies fall downward, and so fill run abroad, and spread it selfe to the margents of the Table, it would follow, that if the Table were of an infinite capacity. the water thus fied, would infinitely flow abroad, without intermission; and so thould Nature set no bound to the thicknes and motion of the water: whereof experience hath fufficiently taught the contrary. Now, that water thus standing still on a plaine aquilibrated Table, should have a Conjeally figure, it may be plainly proved almost by sense, whereby we perceive the middle to be higher then the extreames : for no man can deny but the water thue flanding, is endowed with thicknes, forasimuch as it is a naturall body. Wherefore of neceffity it muft swell about the Table. It cannot be Spharically Concentricall with the whole Earth, because in to imall a fegment of an Arch , as this litle quantity of water admits, it would be insensible. It cannot be plaine, because the sides or extremities of it touch the Table, whereas the middle superficies, by reason of the thicknes, is eleuated about the Table. Neither can we imagine another figure besides, which can aprly be admitted. It is meet in the next place, that out of the grounds of Philosophie, we explaine how it comes to participate this figure: where we are fifft to understand, that the figure of the water is (as it were) copounded of two ipheares; whereof the first is imagined to be concentricall with the whole Earth; the other leffer onely answering to the portion

or quantity of water, were it made round; for if we confider the imple and particular nature of the water, we shall find it inclining to roundnes of it file, as we have showed by experin ent: ver fuch a fenfible roundnes, as cannot have one Center with the Earth. But it we confider the water as i concurres to the conflict ion of the whole Vnigerfe, we shall find this Figure to partake of a creular fegment concentrick with the who'e Earth. Now because neither of these two Figures can precively and exactly arise by it felfe, fith the one must needs fo nivhat alter the other, we must on ceffity ad nit of a figure mixt and compounded of both their; which can be no other then a Cone. To expresse this more plainly (because this path is yet votroden) we find in the water a double motion directed to this double figuration. The first whereof is that, wherey all the parts of a quantity of water, rae inclined to an Abfalute roundais, or Sphæcicall F gure, without refpeet of the Vinue feethe Center of which roundies, is to be fought in the water it felie. The later is to at, whereby the parts of the Water conforming themselves to the Center of the Earth, as neare as they can inake a phericall figure (as much as Nature can (uffer) concent ick with the whol Terrestrial Globe. In the former of these motions, the Witt fiekes it's owne preferuation; in the later, the lafety of the whole Vniuerfe: torthe fafety and confiftency of the whole, is denued from the part; which concurre to preferue the whole. To expresse a little better the maner of these two cocurrent operations; we will take for an vindoubted ground, That God b th given to Nature a power and inclination to preferne ber felfe. This granted, wem it diffing ofh of a wo-tol 1 pre ernations the one Special, wherein every Body feekes it's owne fatety: the other Generall, wherein ail Bodies concurre to the preferuation of the whole: The former proceedes fro nehe speciall Forme and Nature of every Body; which is per ormed by the vn on of all his parts to it felfe; this vnion is gre 1telf of all in a Sphæric ill figure, wherein all the extreme parts are equally diffant from the Center, admitting no Equality of dimension. The Generall depends from the Resultancy and HarHarmony of all the parts, whereby is caused an vnion of all the parts with the whole; to whose prefernation they are secondarily directed; whence ariseth a double figurature of the water; the one of a Spheare excentricali with the Earth; the other also of a Spheare, but concentrick with the Earth; whereof this Conicall figure is capounded. Why this figure should be more sensible in a small drop or quantity, then in the Ocean, may be declared from the same ground well understood; because the convexity of the lesser spheare excentrick with the Farth, is more; and of the greater is lesser for by howmuch lessers the Spheare, the greater wilbe the convexity; and by howmuch greater the Spheare the lesser wilbe the convexity, or crookednes. Wherefore this crookednes being in a small measure of water very sensible, in a maine Ocean will by sense be hardly distinguished from a right line.

8 Of the Figure of the Water vvee have spoken: We must nove speake of the Quality, which is two fold: Saltnes, & Thicknesse.

1 The Water of the Sea is falt, not by Nature, but by Accident.

That the Sea is of a faltish Quality, no man hath ever doubted, at least in most parts: But whither this faltish Quality, effentially agrees to the center of the Sea, as therein created, or elle Accident ally brought in, I find no small difference among Philosophers. Those which defend the faltishnes to be Accidentall, are divided into divers forts: for some of the old Philosophers imagined, that the Earth chased and Heat with the Sun, continually sweats out water: whence is made the Sea. & thersfore should have a faltish taste, because all sweat is of this Quality: But this opinion I take to be no other then a pleasant Allegary of the old Greeke writers, who wrote their Philosophy in verse, & therefore yied such allusions, as we shall perhaps find in many other matters, poetically deused K 2

of them; yet refuted of Aristotle in good earnest: others have more probably conjectur'd, that this faltiffines was first deriued from the Earth, through whole parts the Water being Arained, is apt to receive this Quality, being primarily in the Earth it felte : as we fee water being wrung through aftes. to grow falt: but this opinion feemeth of no great foundnes: because the first Rivers and Lakes being drawne out of the Earth altogether, and in regard of their small quantity, more apt to yeeld and receive this tincture, are not with flanding devoide of all fuch Quality. Befides this, we rather find the contrary by experiment: That Sea Water strained through clay. will turne fresh : as likewise powdred flesh being layed to foake in falt water, will foone turne fweet: The former is verified by Baptista Porta: of the other, every kitchin maide on the Sea fide will informe vs. The third opinion is of Areftetle. who referres the faltish quality of the fea water to the Sunne as the chiefe cause, drawing and lifting vp out of the Sea flore of exhalations, which afterwards mixt with vapours, fall down againe by drops : for the Sunne drawes up the thinner and fresher parts of the water, leaving the thicker and lower water to suffer adultion of the Sunne-beames, and to confequently to become falt : fo that the matter of this faltishnes in the Sea, is an exhalation: the Sun drawing up to the middle Region of the Aire, the fresher parts; where thickned, they descend in raine, leaving the residue of the Sea salt. The forme is the straining and concoction, which is made by the Sun; for the faltishnes is said to arise out of the commixtion of Terre-Ariall drynesse concurring with moisture, join'd with adustion of Heat: fo that two things are chiefly concurring to the Generation of faltishnes; to wit, Drouth and Adustion. This seemes to be prooued by instance of Fresh-waters in the kitchin, which turne falt, being much boyled, because the thinner and sweeter vapours of it are drawne vp, & diffipated, leaving that behind which is thicker & faltish. The same would some haue in the Sea, feethed (as it were) & burnt with the Heate, which we experimetally find in hor water on the fire. But this is excepted against by some, because we find by experience, zha

that many falt wells and fountaines arife in divers places of the Earth, which are ingrendred in the bowels of the Earth farre remote and separate from this extreame heate and adustion of the Sunne-beames: But to this we may easily anfwere, that fuch falt fprings are either by some violence enforced from the fea by certaine secret cavernes, and hotlow places of the Earth: or elfe that they receive their tineture of faltnesse from some salt minerals of the Earth, through which they passe. Wherefore this opinion of Aristotle I see not yet sufficiently refused. The other opinion concerning this quality of fuch, which would have it effentiall to the fea water, and inbred in the first creation, is grounded on two finall causes: First they say that the sea is salt, for the preservation of the Fishes, who would otherwise rot, because experience shewes, that Fish will soone putrific without salt; but this is thwarted by three reasons: First, because if fish were in this fort salted in the sea Water, the cooke might saue himfelfe a labour in falting them againe in his kitchin: Alfo Fifhes caught in the lea, are oftentimes preferred longer and fweeter, lefte needing falt then those which are found in fresh Ponds and Rivers: Secondly, if this reason should hold currant, why should not the Fishes also rot and putrify in fresh Water? Thirdly, why should fishes cover the fresh Water (as we see by experience in many fishes) if in it they should suffer putrefaction, which is a greateniny constura; Aboue all what need we feare this putrefaction of fishes, while they are endowed with a living foule, which is a greater prefervatiue then all the falt in the world; or why should we not doubt the same calamity in all living creatures in the land, which are as subject to rottennesse in the Aire, as the other on the land? The second cause (fay they) Why the sea should be created falt, is; Because the sea it selfe should not putrify, for asmuch as we find by experience, that salt is the only thing to refift Putrefaction; But heere we may demaund; why thele Authors should seare Putrefaction in the vast body of the fea, rather then in other Waters and Rivers, which are neither salt, nor come neere the greatnesse of the Ocean; whereas K 3

whereas Aristotle affirmes in the fift chapter of the 4 booke of his M. teors, that if the fea were divided into many parts, it would more easily dissolue and putrify. The grounds of this opinion being overthrowne, there want not reasons to contradict: First (l'aves one) if the sea were not created salt, then was there some time wherein it was fresh: To this I answere two waies: First, that it might be created fresh, yet being apt from the heat of the Sunne to receive falmeffe, it might, almost at the first receivest. Secondly, if I should grauns that it was a long time before it embraced this quality, I kno ve neither Historie to confute me, or reason to convince me. Secondly, it is viged from the Nature of living creatiles in the fea, that they cannot well live infresh waters, and therefo e it seemes originally falt, and no: by Accident: But this is of no great force: First, becau e experience shewes, that many kind of fishes live in both, and many rather cove: and defire the fresh Water, then the sea: Secondly, it is no improbable. that as the fea by litle and litle and by degrees turned from freshnesse to salinesse, the temper and disposition of the fishes. was in like manner changed and altered: Whence it may come to 1 affe, that fishes fince bred and nourshad in fresh Waters. cannot fo well endure the falt. Moreouer who knowes whether all these severall kind of fishes now found in the sea. were from the beginning, fince we fee by experience, that fundry kinds of living creatures daily arife out of putrefaction on the land, which may with like probability, or more, be admitted in the fea. There are yet behind other reasons of one Patricia a Platinist, who would oppose Aristotle in good earnest. Aristotle (faith he) speaking of the falcnes of the fa Water, shewed not the cause. For I would aske, why that parcell of water, from whence the thinner parts are extracted, should remaine salt: was it so from the beginning, or afterwards imp est; was it Inb ed, or Accidentall? It he would haue it an inbred quality from the beginning, he vainly goes about to feeke out the cause; If the saltnesse be adventit ous the crute is to be given; but the cause given by him, is not true, for almuch as it rather takes away the falmes: But to thicle

these objections of Patritims, spanne out in many words, we may answere two waits: cut of that the saltnes is merely deventicious lited by an exhibition, drawne up by the Sunne, and so distilling dewneagaint; or else, because this answere seemes not wholely to saltny. (For assumed as ramy Water is seldome talt, and if it were, could hardly flow in so great quantity to feed the saltness of the sea): I will answere secondly, that the saltnesses adically or originally in the matter of the Water; yet so, as it cannot be drawneout and sensibly be perclived in the mixture of many sweet humours, toysed with it, without a separation first made by the heat of the Sun of the thinner parts from the thicker: So that the Sunne is a disponent, though not a productive cause of this saltnesse in the sea.

2 Seas absolutely salt are never frozen.

This may feen e a Parad xe to forme men, in regard that amongst . in Ge graphers, we have so often mention made of Mare Congel. tum, tak ng it's name from the Ice wherewish it is thut vp from passage; as also for that in the voyages o' Froissher, Danis, Hudson, and o her later Navigatours, whi have bin imployed in the fearch of the Northwell paffage we find fuch thrange relations, not onely of Seas cioled vp with Ice, and hindring their passage towards the North; but allo of Rocker and Hands of Ice, of an incredible greatnes. The truth of these Relations I no way disapproue, but rather out of these tellimonies, approue our former aff rtion; that Seas which are wholly Sait, are never found to freeze: Forfirst whereas it is called e Mare Congelatum, it may beare the name wellenor gh from the multiti de of Ice flooting on the water, or cellected into a Rock or Hand. This we (as it will eafily appeare) is not produced out of the fubflance of the Salt water of the maine Ocean, but rather carried into the Sea by great rivers of f esh water tunning i to the Ocean : For the rivers are not alwaies frozen: but iometimes by a remission of the cold are the wed, and the preces broken afunder, and florting into the Sea, in it oft ames meet in great heapes, which may be proved: I In that the legreat rocks of Ice melting with the teare

heate of the Sun, have dissoluted into sountaines of fresh water, gusthing downe in great abundance, wherewith somtimes in case of necessity, they have fraughted their shippes, as we have testified by the fore-named Nauigatours. 2 Because some part of the maine Sea, situate perhaps more Northerne, and in a colder Climate, suffers not this accident: whereas places neare the shore, farther South, are almost alwaies frozen: The reason whereos, is; because the Sea neare the shore is commonly mixed with fresh waters, conveyed in, either by great Rivers, or infinite secret passages under ground, which we see not: The reason why that falt waters exclude this propriety incident to the fresh, I take to be the Hot spirits, hid in the salt humor, which are more served and operative, then those of the sight water.

- 9 Somuch for the faltnesse: The next, is the Thicknesse: whereof we will set downe this short Theoreme
 - i The Water of the Sea is thicker then other Water.

This Proposition hath it's light from the former: because thicknesse of Water is a companion of the faltnesse, as depending from the same cause, to wit, the exhalation, and extraction of the thinner parts of the Water. There are many finall causes given by Patricius of this thicknes of the Sea Water. First, because the parts of it should more strongly hold together, and not couer and ouerflow the firme land : But this feemes to be grounded on an errour, that the Water should be about the Land; and that it should contain it selfe within it's own bounds and limits, which opinion we have elfwhere rejected. The second cause of the thicknes of the Sea, is; that it might be more apt to beare and carry ships, and other great weights for the vie of man. Thirdly, the Water being thicke. may more cafily be converted into falt, out of which, many faltish minerals in the Earth are ingendred. Other causes are. giuce

giuen by this Author, but lesse forceable ', which we will omit, as referring them to the Philosopher, whose proper taske it is to seeke them out.

CHAP. VI.

Of the Motions of the Sea.

- He Motion of the Sea, whereof we are in this Chapter to treate, is either Naturall, or Violent. The Naturall I call that, which is partly incident to the Naturall Disposition of the Sea.
- 2 This againe is two-fold, either Generall, or Special: Generall is that which agrees generally to all, or at least to most parts of the Sea: such as is the Ebbing and Flowing of the Sea.

Motion; The first is common to all heavy Bodies, as well as the Earth, in which is an inclination to come as neare as they canto the Center of the Earth, whereof we have spoken in our former booke. The second is that which more properly agrees to the Sea, which is againe two-fold: either the Naturall, or the Violent. The Naturall, how societ requiring perhaps the concurrence of some external cause, is not with thanding so called; for a simuch as it chiefly seemes to proceede from the Disposition of the Sea-water; The Violent is caused meerely by the violence of the windes moving the Ocean. The

Naturall motion we have again divided into Generall, or Speciall; because the Affluxe, & Refluxe of the Sea, whereof we are to treat, is generall throughout the whole Ocean, (forme perty creekes perchance excepted) whereas the Currents, (which is the second kind of motion) are more speciall, as agreeing not to a l, or most parts (as it seemes) but to some one or other speciall place, as we shall show.

I The Seatwice enery day ebbes and flowes.

The flowing and obbing of the Sea, howfocuer it cannot be precifely observed in all Seas; yet because few places of the maine Ocean are exempted from it, deserues the first & chief. eft confideration. That such a motion there is, experience shewes; but the searching out of the cause, is, for ought I can observe, one of the greatest difficulties in all Natural Philosophie: infomuch as Aristotle one of the acurest Philos phers, is reported to have flood amazed at the flowing and ebbing of Euripm, and despairing of finding out the cause, at length enforced to cast himselfe into the River which had be ore confounded him. Wherefore it may feeme sufficient for me to trace their steps, who have waded far into the search of this cause, having very litle hope to goe further. The first opinion was of the Stoickes, who supposed the whole World to be a great liuing creature, composed of diverse Element, which injoyes both breath and life: This living creature they imagine to have his noftrils placed in the maine Ocean, where by drawing in, and fending foorth breath, the ebbing and flowing of the Sea is caused: but this seemeth rather to be a poericall fiction, or Allegory, then any conceit of a Philosopher. Apollonim Tianam was of an opinion, that certain Spirits either vnder, or aboue the Water, breathed into it this motion. Timaue taught the cause of this moisture to be the rivers breaking into the Ocean by the great mountaines; Plato thought that it was made by the swallowing vp of the Sea into a gulfe or hole, which being againe cast out, was the cause of that motion in the Sea. Selencin the Mathematician, which affirmed that the Earth was carried round with a perpetuall motion, thought

thought that the Moone was turned round with a motion contrary to the motion of the Earth, and from this to proceed that motion of ebbing and flowing of the Sea, whereof we now treat. What Ariffotles opinion was concerning this matter, is an vncertain conjecture; foralmuch as litle or nothing can be gathered touching this point in controversie out of any booke, which is certainly known to be Aristotles: for the tract of the propriety of Elements, where the cause of this motion is ascribed to the Moone, is judged to be none of Arifotles, but of some later Author. Yet Plutarch imposeth on Ariftotle this opinion; that this motion of the Sea should come from the Sun, because by it are raised vp many windy exhalations, which should cause the Sea to swell, blowing into the great Atlantick Ocean. But this opinion is charged by Patricius of a threefold error: I That it should proceed from the Sun; 2 From the wind; 3 That it is only in the Atlanticke Sea. He law (faith Patricism) that in the Atlantick, which he could not in the Egean Sea at home and neare Athens. For I No wind blowes to regularly, that for one fix houres it should blow forward, the other fix houres backward: for the wind oftentimes blowes many daies the fame way without ceasing; yer is there not one only flowing or one ebbing in the Sea. 2 The Sunne stirres vp sometimes windes, and sometimes stirres them not vp. But of a perpetuall effect which is daily, why would this Philosopher give a cause meerely violent, and not quotidian, which notwithstanding would have nothing violent to be perpetual! ? If the Sea be somewhere moued naturally by other motions, as the Euripus, (which is faid to be his death) wherefore will he deny this motion to be Natural, seeking oat an externall cause of this effect? But all this while our Platonick Philosopher seemes to fight with shadowes: for what judicious man can imagine so judicious and wife a Philosopher as Ar statle, should to groffely overshoot himselfe to father this opinion? I should much rather belieue that no such opinion is to be found in Aristotle, at least that it is indirectly related: which I the rather believe, because one Cafalpinus a late Writer, as well opposite to Aristotle, as the other

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other hath related Ariffotle's opinion otherwise; to wit, that the ebbing and flowing of the Sea, is derived from a double caute: whereof the one is the multitude of Riners bringing in a great force of waters into it : whence it comes to paffe that it flowes only towards one part, which is the lower, as it happens to the Mediterranean; For the Agean and Pontick Sea, with Maotis, flow into the Tyrrhene, and not on the oppolite fide: The other cause he makes to be the libration of the whole Sea: for it is often turn'd from one fide to the other. which in fo great a valines feemes but litle; but in straights & narrow places much more. So that Aristotle (faith Cafalpimm) would have that to agree to the Sea, which viually happens to a paire of ballance; which having received the beginning once of their motion, are inclined sometimes this way. & fometimes that way, by reason of the aquality of the weight: for if the weight on one should ouercome, the whole would incline that way, and would not rife vp on the other fide. But seainst this opinion imposed on Aristotle , Casalpinus not without good reason, excepts, that the Superficies of the Water being Aquidiftant from the Center (25 is supposed by Geographers) no reason may be given why it should incline more to one fide then another, having once obtained his true place: fith according to Aristotle's own grounds, no violence can be perpetuall. To which I may adde another answer, that no fatiffactory reason can be alleadged, why it should alwaies observe so true and just periods of time in it's motion; fith all Rivers are sometimes encreased, and other times diminished according to the feafon of the yeare, and variety of the weather: wherefore the faid Authour, which impugnes this opinien, hath framed another conceit, grounded on the eirenlar motion of the Earth, which he explaineth in this fort. It agrees to reason (faith he) that the Wa, er should not altogether follow the motion of the Earth, but should in part be driven back, and in part flow befides: for fince it is of a moist nature, while the Earth is carried from the Aire about it, the Water is somewhat left behind; as wee may see in a small vessell, which is more large then deep: for if it be moved forward, the Water

cannot

Water will leap back to the opposite part, & will oftentimes poize it felfe! itt er & thither, feeking an æquilibration: when therefore the Earth is a litle carried forward & the water (as it were) left behind, being out of his Aquilibrium, or aquall poize, i. will run to the other part, but beyond the true poize; for the violence of the motion impressed into it in the beginning, from thence, for the same cause, it will tend againe to the opposite part, doing this oftentiales, seeking an aquall weight, wherein it may rest: so that if the Earth should at any times reft from her naturall motion, the Water would also leave off the Libration to and fro. But because the circumvolution of the Earth is imagined to be perpetuall, the libration of the fea is also perpetuall: so far forth then that this motion is of the continent or Earth, it is only accidentall in the Water, neither besides his proper nature, neither according to nature: But so far forth as the Water is in some fore moued in the Earth, it may be faid to be according to nature: for it alwaies feekes the lower place, because it cannot aqually follow the motion of the Earth. Hence they give the reafon, why this motion is not perceived in Lakes and Rivers, as well as in the maine Ocean: for fith the motion of the Earth is not very fentible, it cannot be perceived but in a great maffe of waters. The reasons to confirme this opinion, besides the refutation of other opinions, are chiefly these two. If the Water by it selfe should be mou'd without the motion of the Earth, it must needs be moved either according to, or against his nature. But neither of them can be graunted; First, ifaccording to Nature, there would not be one only motion of one body according to nature, but many, which is denied by Ariffotle; If befides, or against Nature, some violent motion would be perpetuall, which also seemes absurd; wherefore it must needs follow, that the sea should move accidentally: For fith the Water is conteined outwardly of the Aire, internally of the Earth: And that part of the Aire which toucheth the Water is of Aristotle called Stagnans or standing still, not flowing, as that which it about the Earth, but is only troubled varioully with windes. This libration or motion of the Water

cannot be caused by the winde or Aire, wherefore it must proceed from the motion of the Earth. The second reason may be drawne from the quantity of tides in divers places of the Earth, for it is found by experience, that the Water swels higher and greater in the maine Ocean, then in other leffer Seas: For it is observed, that about great Brittaine, it mounts fomtimes aboue 80 cubits: also it oftner ebbes and flowes in leffer currents, because the spaces of this libration are shorter and straighter: or because besides the motion of ebbing and flowing, which the Mediterranean seas partake from the Ocean, at Hercules Pillars, they have a proper libration in their owne channels: whence it comes to passe that in some narrow leas, as in the Euripus, besides Euboia, the sea seven times a day ebbs and flowes; whereof there can no sufficient reason be given from the motion of the Moone or other cause whereto other Philosophers ascribe this effect: This opinion of Cafalpinus seemes to carry great likelyhood of reason and congruity with experience; yet because it is grounded on the circular motion of the Earth, which feemes a paradox to most men, I dare not warrant it otherwise then probable, neither can it well stand with the grounds of our Magnetical Philosophers, because they affirme the whole spheare of the Earth and Water together with the Aire to moue round with one Vniforme revolution, in such fort as one should not moue to the opposite part, or stay behind the other; as they would haue it heere to doe. There is yet another opinion more commonly defended in the schooles of natural Philosophers; that this motion of the sea is to be ascribed to the Moone, as the principall cause: others againe, as they admit the Moone to have her operation in this effect, joyne other causes to it: and indeed this feemes more probable: for there want not arguments in Patritim and other later writers, to shew that the Moone cannot be the fole cause of this motion: First, because this motion is not observed in all seas, Lakes, and Rivers, whereon neverthelesse the Moone hath the like dominion: But experience shewes the contrary: for besides fresh Rivers it is manifeli by observation of travailers, that this ebbing & flowing

flowing is not to be found in the Hircan, Mantian and Dead Cea:alfo in Maotis Palus, in the Pontick, Proponticke, Lizurian and Narbon Streytes, neither in the Tyrrhene fea: Moreover it is not obf rved in a great part of the Red fea: Neither can the Narrownesse of the channell excuse it, because these seas are great, and also for the most part within the Tropicke of Cancer, and therefore exposed sometimes to the perpendicular beames of the Woone. Secondly: If the Moone should by her owne force excite and moue these waters, then would it moue those seas, which it doth moue, Altogether and not only in parts. The contrary whereof we may find: First in the Red Sea, which in the beginning and end, Ebbes and flowes, but in the middle not at all: moreouer the Mediterranean lea ebbes & flowers as one fea. on all the coasts of Africa, wherein it is in a fort divided; and yet those seas, with which it is soyned, as the Tyrrhene, Ligurian, and Gallican Seas, feele not any fuch motion. Thirdly, it is objected, that if the Moone were the only cause of this Flux and Reflux of the sea, then those seas, which are faid in whole to moue, should aqually flow in hight: but this is contradicted by experience: because some flow higher, and fome lower. As for example: The Adriatick fea in the inmost creeke neere Venice swels neere foure foote in hight, but the rest of it, not about two soote; which increase is likewise observed in the Agean, Cretian, Ionian, and Cyprian Seas, also the Syrian and Egyptian, even to Fortus Ferina: But from mins pulcher to the Herculean streytes, it increaseth aboue two footin length: But without these straights, the same Ocean by the coasts of Portugall and Bifeay, and France, the Sea rifeth viually to 15 foot in hight; and neare the coasts of Belgia and Brittaine 18 foot: At the confines of Briffoll to 60, and thence to the borders of S. Michael to co: But at the coasts of Ethiopia, neare the Allantick shores, it rifeth not higher then in the Adriatick Sea: But neare the Hands of Madera, the Canaries, and S. Thomas, it furpaffeth not the hight of Venice : But in America, on the Lithermost coast from Florida Sinus Mexicanus, the coasts of Brafile, and Paris, more then three thousand leagues, euen to che-

the Magellane straights it increaseth almost to two Palmes bredth: but farther South to Panama, and all those Southern shores, the ebbing and flowing is of an excessive hight, as may appeare by the coalts of Cambaia, India, and Taprebana: Thirdly, if the Moone by a naturall vertue should move the Waters of the Sea, then would it move the Ocean and the Mediterranean Seas in the course of windes, with the same Fluxe and Refluxe in the same windes. But this thwarts experience, which is thus proued: The Med terranean Sea, when as it flowes in the Adriaticke, Ionian, and Sycilian Seas, the Water flowes towards the Land, when the Moone is (as the Marriners speake) in Sirocco & in Maestro; but ebbes or flowes back from the Land, when it is in Greco at q, Garbinio : And contrary wife the Ocean swells when the Moone is in Graco & Garbinio; but affwageth it selfe againe when it is carried in Sirecco & Maestro. Fourthly, if the ebbing and flowing of the Sea should follow the Moone, then all places in the same distance should ebbe & flow alike at like houses. But the contrary is proued by an experiment of Patricia, who reports, that at the fame houre places diffant 20 degrees, have bin feen toebbe or flow alike, and the places betwixt alfo to vary and obserue no just proportion, Fourthly, if these Surges should be Rirred up by the Moone, then the same superficies of the Water the same houre should be carried by the Moone : but this is contrary to the observations of Marriners, who have observed, that on the Norman coasts, and that of Picardy to Callice, the Tide happeneth the ninth houre from Midnight; but ten miles from the shore not a full houre, but at the twenty and fixt mi'e from the middle of the channell, and voder the same Meridian at 22 houres. Fiftly, if the ebbing and flowing should proceed from the Moone, then should the Water at the fame houres increase and decrease: but this is opposite to observation: for at Venice the Sea is knowne to flow sometimes for seuen, sometimes for eight; but ebbes in fewer houres. But about the mouth of the River Senega in the Atlanticke, it is comming in foure hours, but goes not back under eight: so about Goznamia Oftia, the Tide is comming

in seuenhoures, but goes back in fine. Sixtly, if the Waters flow by the Moone, then should they be drawne and carried by the light of the Moone: because all action is by a touching. and the Moone toucheth the Water by her light : but it is found by experience, that at midnight, when the Moone is most distant in her light, our seas doe no lesse ebbe and flow then when it is present: & so the Seas neare the Antipodes doe ebbe & flow, when the Moon is present with vs. 71, if the Moone were the onely efficient cause of thismotion, then the fame light being preset the same agent mouing, thesame effect should necessarily follow. But we find that it produceth two. contrary one to the other: because in her ascent to the Meridian it is supposed to lift vp the water, but a litle declining from the Meridian, it is thought to depresse & asswage the waters. 817 if this effect were ascribed to the light of the Moon, then when the Moon shines not, there should be ro such motio, because cotrary causes produce cotrary effects. But we observe the same ebbing & flowing in the coniunttioner New Moon, when the hath no light, as in the ful Moon, whe withful face the beholds the Sea: for in both these times we have highest tides. These & many more arguments are viged by Patricia, to shew that the Mooncannot be the cause of this motio in the Sea; of the other opinion, that this effect is ascribed to the Sun, among tothers I find the chiefe patron to be Telefins, who taught that the Sea was moued in this wife, because it would avoide the operation of the Sunne, fearing left it should be too much disfolued into vapours, and so perish. But this opinion seemeth far more weake then the former. For first I would aske concerning this motion, wherein it is thought to auoide the Sun's heat, whether it be voluntary, or necessary? It cannot be Voluntary, or a free action, because the Sea is no living creature, to which only fuch a motion is incident: If it be nec. fary, then it is Naturall or Violent: It cannot be Naturall, because according to Aristotle, one Body can have but one natural motion, but the Water being a fimple Body, hath another motion to fall downwards towards the Center: wherefore it cannot also admit of this. It cannot be violent; first, because no violent

lent thing can be perpetuall: Secondly, no cause can be thought voon Externall, which should cause this violent motion : and if any fuch cause there be found, then is not this of Telesius the first and principall cause, fith it is referred to a farther cause: Thirdly, no cause can here be shewne according to this opinion, why all other waters, as fresh Rivers, should not likewife ffriue to hide themselves fro the face of the Sun, Fourthly, he should give a reason why in the Belgick and Ermoricke fhores, which are far more distant from the Sun, the same motion is no leffe eminent then in Taprobana, which is subject to the Torride Zone; and why in the Iland of S. Thomas, which is immediatly under the Aquatour, there is not a greater working of the Water then at Venice. Fiftly, that which Telefins brings to confirme his opinion, is no leffe warrantable then the maine point in con roversie. In the Summer (faith he) the flouds are leffer, because the Sun raileth vp th mer vapours, which are eafily diffolued: But in the Winter they are leffe, because the Sun is of least force, and so raiseth up fewer vapours to worke vpon the Sea: But both these maters are proued falle by experience: first, because in the Summer we have as great a working of the water as at other times: In the Winter also as great, or greater. Secondly (faith the faid Authour) In the full Moone the motion is greater, because the much lightarifing from the Moone, drawes vp many vapours. In the New Moone; because the Aire being refrigerated, the internall Heat of the Sea collecting it felfe, is made stronger with more vapours: In the quarters of the Moone, because there is not much light cast from the Morne, and the Heat of the Sea is not fo much collected by the externall cold of the Aire: To all these maters we may easily answer: First, how can the Moone bellow any light on our Seas, when the is with the Intipodes? Secondly, where he faith, that the internall Heat is gathered rogether, and made fronger by externall cold; I First I aske how the Sea can fend forth these vapours; i'the vapours kept vnder doe raise the Sea vp; or if the Sea fwell with these vapours in her wombe, how can she let them out? 3 How will he proue the Sea naturally to be hot, fith it

is one of the cold Elements? Thirdly, where he faith, that the light of the Moone is but in halfe imparted to the Sea; why should not the Sea proportionally in half be stirred vp? wherfore Patricins and Calman finding ne ther the Sunne nor the Moone of it selfe to be a sole and sufficient cause of this motion, having joyned them both together in this causality, and added belides other particular causes: first (say they) there are two kind of causes concurring to that effect : either Uninerfall and externall; or Tarticular, internall and next causes. The Universall causes are two; to wit, the Sunn: and the Moone. The Sunne (faith he) with the heat of his beames and light doth conferme, vivificace. and flir vp to action, the Internall and originall heat in all things here below. This Heat being stirred up and vivificated, all things are made fit for motion, and being so accommedated, are stirred up to motion, as if from an Internall life they should be promoted to an Externall: for as in the primary life of things, the motion and action is shown; in the Essence; in the secondary, the action and motion outwardly in respect of other things: so the first and originall heat of the Sea, cherished, and stirred up by the external heat of the Sun, drives the Ocean, and moves it to action. The Moone alforberisheth, preserveth, vivificates, nourisbeth, and firres up to motion, all these earthly bumours and moistures: and as the dayly by houres beholds the Sun as her darling . & by him is (as it were) big-bellied with lively feedes, fo fhe beholdes her love, the Ocean, dayes and nights, aud fills the Ocean with these seedes which she receives from the Sunne. But this cannot be performed without her metion, without the diffusion of her light, without the effusion of her influence & feeds; where ore it cannot otherwise be, but all our humours and moiltures should be made fruitfull, conceiue life, bring forth, beare fruit, and be stirred up to life and motion, by the motion of the Moone, through the Affect of the Moone with the Sun, with the Earth, with the Ocean: wherefore all lower moistures are subject to the power of the Moone: Notwithstanding all are not squally vnder her dominio; fith all are not of the fame substance, of the same Rarity, or density, or of the same Heat. This M 2

This much of the vniverfall causes of the motion of the Sea. according to this opinion. The particular or nearer causes are fuch as are found in the Nature of the Sea it felfe; and thefe are two: the fluidity derived from the Radicall and first moifture; & the falineffe drawne from the originall, & inbred Hear in the Sea. That is most subject to the dominion of the Moine, this of the Sun: The faltnes therfore of the Sea feemes the nearest & most proper cause; & no other common Nature. why the Sea should be stirred with so many motions: for no fresh water is moued with so many, nor suffers any such Flux and Refluxe as the Sea. Then must the saltnesse be the nearest and most proper cause: But by what meanes doth it worke? It is answered by Patricius, that falt water hath in it more hear then any fresh water whatsoeuer; And though spirits be hid in al! moisture; vet farre more in falt, then freshnesse: wherefore from these spirits existing in the salt humour, is the Sea turned and toffed with fo many motions: amongst which, the chiefest & most remarkeable of all is that of the Ebbing & Flowing of the Sea: for by these motions, the Sea as a Terre-Rriall Heaven, followes and imitates the superior; wherefore it feemes evident, that from fuch a motion should be derived the motion of the Sea. This opinion seemes to have great flew of probability, & to be more foud then all the reft: but whether it will in every part fatisfie, I much doubt : yet must we embrace it, vntill such time as a better be found out.

2 All seas doe not ebbe and flow alike; Neither the same at all times.

That a great disparity is found in diverse places of the sea, concerning the afflux and reflux of the Water, is manifest out of many instances, we have shewed in the sormer proposition: it will be enough in this place, to give some reasons for this variety. This disparity then is found to be two-fold; so: some seas neither ebbe nor flow at all; others ebbe and slow: Againe seme ebbe and flow more, others lesse. Againe in respect of time we shall observe besides daily comming and going

going of the Waters, Weekely and monethly changes, of all which branches we shall have occasion to treate heereafter according to those footetlepps, which I find in the best writers. First therefore the want of this motion of ebbing and flowing in the fea, is by fome Authors afcribed to many particular causes. 1. The Freshnesse or want of falt in the Water. 2 The Graffiende and thickenesse of the Water ? The overmuch thinnesse of it. 4 The extreame depth of it. 4 The narrownesse of the Channell: All which either joyned together, or in part, may hinder, if not altogether take away, the ebbing and flowing of the fea in those parts: which we shall the better understand, if we instance in some particular seas most remarkeables The Caspian sea is reported to be of this condition although fome have doubted,) that it neither ebbs, nor flowes: This affection is imputed to two causes: First, The want of salemeffe; Secondly, the extreame dopth: By the former it is vnapt to generate spirits, which should give a motion: And by the later, the Sanne-beames, which concurre to the stirring vp of thefe fpirits, are hindred from piercing to the very bottome of the Water. That this fea should little partake of saltneffe, may eafily be perswaded; forasmuch as 80 Rivers of fresh water, with & Lakes of no small quantity, are disburthen'd into this fea: Among the which are Ochm fro the Eaft; Cyrus fro the West, Araxis from the South, falling into it with 40 Infers: and Volga from the North, running into it with 70 Inlerts. All which fresh Rivers, some of them exceeding grean, must needs make this fea very fresh. To this may be added, befides the authority of Contarenus, confirming this by two other realons: First the Trons and Lampreyes, which is a kind of fish altogether delighting in fresh Water, are there taken in great abundance: Secondly, that on a certaine coast of it, the Water ofit's owne accord congeales into falt: The reason whereof is, because falt Water mixt with fresh will more eafily congulate and congeale into fak. The depth of this fea is also sufficiently warranted by such as write of it, especiall the former named Contaronus. Secondly, the Lake called Aphalwer is thought neither to ebbe nor flow : which befides these M 3 realons

reasons alleaged from the Caspien Sea, may be ascribed to the thickness of the water, not suffering any thing to linke into it: So that for the craffitude of it, it must needs be heavier then other Water, and for more vnapt for motion. Thirdly. it is recorded by fome that in the inmost creeke of the Red feat there is a motion; and so in the mouth of it, by reason of the Ocean: but in the middle no fuch matter is to be observed: which strange effect some ascribe to the Thinnesse of the Water one of the causes about named) begetting fewer and weaker Vapours and Spirits: which either Breight-way breath out. or are too weake to raife vp the Water. This thinnesse is confirmed to be in that middle part of the Red fea, not only out of the authority of loba Barro, out of the experiments of loba de Castro, which found this Water to be clearer and liker to Christall, then that of other parts; but also by the cleare perspiculty of it: For in almost all the sea may the bettome plainly be seene. Fourthly, we read the like of the Balt ck sea: that it neuer ebbes or flowes, which Bartholomen Keckerman, that countri-man, afcribes, 1. To the Narrauneffe of the channell: 2. To the depth of ic. 3. To the northerne ficuation: which cause I thinke he might well have spared, considering that more Northerne feas then that, both ebbe and flowe, Fifelye it is reported of Maotis, Pontus and Propontis, that they Howe from the one to the other, but never ebber For Meetis flower into the Pontick fea as from the higher place into the lower; and the Poweick into the Propontick, and Egean for the same cause, but returne not back againe. But besides this cause of this declinity of the ground, it stands with reason, that the Water should be fresher then that in other places of the fea: For first, all of them receive into them many and great Rivers of fresh Water; for Maotis Palus, befides other, partakes of Tanais. Into Pontus fall according to Areanns report about \$2 fresh Rivers : syncteof the chiefe are Ifter. Hofpanis , Berifthener, Tannis, Phofis, all great currents. Secodly the forenamed fifthes, which delight in fresh springs, are heere also found in abundance. Besides this freshnesse (if we beleeve ancient writers, as Pling and others) it is a fea of ex-SEO ESI tra-

traordinary depth, fo that for this cause some part of it was called Negr pont, or the black fee: Which blacknesse was by fome, thought to arife from the depth of it: wherein in many places, they could found no bostome. Sixtly, it is teffified of the Tyrrhene Ligurian, and Narbon feas, that they uffer not this motion. The cause of which is only ascribed to the extreame depth; for few or no Rivers are diffurchen'd into it. except Rhodanus; We are in the next place to fliew, why this working of the fears more in one place then in another: The reafons whereof (although many be thought on) are cheifly reducesteither to the excelle of faltnes in the water, or the marrownelle of the channell, into which from an open place the fea is to be diffourthened, or the Mallowne fe of the shore: All which either cocurring together, or taken by thetelues aparr, may cause the sea to swell more in one place then another; which may, as the former, be proued by diuerfe Instances. Foure Seas are more particularly noted to flow and fwell higher thenother. The first is that compasseth about Europe from Hercules pillars, which according to diverse shores, takes diverse names; as the Portugall, Cantabrian, Gallican, Belgicke, and British Seas. And in the New World, or America, the Southerne Sea shalbe the second: The third is that of Cambaia and India: The fourth is that which compaffein about Taprobana: for the three last, the causes fore-specified, feeme manifeftly to concurre : for Taprobana is reported by Pling to have a shore not above fixe paces deep, and the Sea to be greene and overgrowne with weedes, infomuch that the tops of the weedes fret their thips; and later Writers report, that the Land is knowne to augment the confines by reason of the shallownesse of the Water : so as we have shewed that fome Seas neither ebbe nor flow by reason of the depth of the channell; fo on the other fide must it follow, that other Seas ebbe and flow more by reason of the shortnesse and shallown: fle of the shores: for of contrary causes proceede ordinarily contrary effects. Moreover it stands with experience, that in any Water or Sea, where the flood is stopped and hindred by quick-fands, it returnes with greater force, as it were enraged .

ged, & swels so much the higher, which is the cause why inthe coasts of Cambaia it is lifted up so high, because the shores are fo shallow, and so short, and exposed to impediments, that in the ebbe, the Sea runnes backe many miles, and leaue's the fands vncouer'd: Whence it must needes returne with greater violence. This also is found in the Indian Sea, and neare Paname in the Southerne Sea, where the Sea running back for two leagues, certaine Hands and Lands are left naked; fo that in thefe three Seas here named, the Sea scemes to enlarge it's limits in bredth more then in other places; to which we may ascribe this effect. For the Seas about Europe, we may pronounce also, that for the most part they have short & shallow shores, as may easily appeare in the confines of Belgia: But it may be objected of the English shores, that they I well very high, albeit the depth of the Water in the middle is found to be 144 foot: Here must we have recourse to the other cause, the flowing of a large & wide fea into a narrow chanell: for the large torrents of water runing swiftly into a natow chanel, being hindred on both fides by the shores, fro spreading it self in bredth, is enforced to swell in hight: so that the effect is rather to be ascribed to the violence of a greet current, enbosoming it felfe into a streite chanell: which may more evidently thew it felfe in a infrances. For in the streite chanels of Zeland and Helland it is lifted up about three foote: At Briffell in England, by reason of a greater force of Waters tunning from the fea into a more narrow channell, and feconded by the maine Ocean at the back, it swels to the hight of 60 foote: In the Armorean seas, where larger seas are emptied into more narrow fireites then the former, it increaseth to go foote: Out of which experiments may we plainly collect, that to the increase of the motion of the sea besides the faltnesse of the Water, two other causes are concurring; to wit, the shallownesse of the shore, and the freitneffe of the channell, wherein a great and large sea is to be exonerated. This may lastly be farther illustrated from the disparity of these seas with others, for in the Adviatick, Agean, Ionian, and almost all the African seas, the sea seldome swels to so great a measure: whereof

the cause is as well the depth of the seas, as the aquality of the shores: for as the depth is a cause that somtimes it flowes not at all, and the inequality and fhortnesse of the shore that it flowes high: fo a meane hight of the Waters from the bottome, and a more aquall figuration of the coasts may be a cause of an indifferent working of the Water. Hitherto we have shewed the variety of motion in the sea, in regard of the diversity of places: we are next to speake some thing concerning the variation of it in regard of the times, which, though it properly appertaine not to Geography, yet am I loath to leaue it out, because the discourse is pleasant. Concerning which point the marriners make fix degrees of change in the tides according to the times. First disgnal, whereof we speake in this discourse: The second Hebdomodary, or weekely which Possidonius called monethly of weekely; because it is distinguished by severall weekes of a moneth. but tarries not till the end of the moneth: For it is found by experience of Navigatours that a day before the conjunction of the Moone with the Sun, and the day of consuntion, and a day ofterwards, the feas in the maine Ocean have their greateft flower and ebbes, being lifted higher and laid lower downe, & then the tides are most swift: The fourth day from the conintiction, the tide is leffe and leffe fwift: The fift vet leffe then the former; and the fixe day leffe then the fife: But in the feventh day, which is a day before the quarter, and in the eight following, wherein it is halfe-faced; and in the ninth, which is a day after the quarter, the fea is, as it were, dead, not much flirring, neither much ebbing or much flowing; which was (as it seemes) only observed by Pliny in the Enboinn Enripus; bur whether it so happen else-where, I leaue to men experienced in these matters; This motion as it doth encrease according to the age of the moone: So it is faid proportionally to decrease againe. The third motion is monethly, which seemes in the time of the confunction, wherein the featides are highest and fwiftest. The fourth is called motus semestris or fix-mouthly, happening at the times of the AgumoEtial; differing one from the other like monethes; The fit is called Trimestnir,

because it happeneth only in three moneths distance. The last is Annuall which Patritius witnesseth that himselfe saw in Liburnia, in the moneth of lanuary. These motions I carelessly passe over, because the distinction seemes to me full of vincertainty and scarce warranted, and such experiments as are brought for the proofe of it concerne rather particular places, then the generall nature of the sea.

3 Hitherto of the generall motion of the sea. The Speciall is that, which is observed in

fome speciall places.

I It is probable that the sea is carried some. where from East to West, and some where from North to South, and contrariwise.

It hash beene a received opinion amongst Philosophers of this later age, that the sea by the rapture of the heavens should be moved round, as it were, in a diurnall course: which they have laboured to prove by divers experiments. First, because it is observed by mariners that a ship can well saile from Spaine into America with an indifferent winde in 30 dayes, when the can hardly returne under three moneths, which they afcribe to the circular motion of the fear For a thin going from East to West failes with the Water, but from West to East against the streams, so that the one must needs be swifter and the other sower. Their second experiment to confirme this point, is of a flup failing from Spaine to Helland which may as they few swifter returne back then goe thisher. To this motion of the Water from East to West, Inloss Souliger hath added another, which he would have to be from Nersh to South from Terra Laboratoris Southmard. But Pairieins not denving these motions, would have many more in diverse Seas, not admitting any valuerfall circular motion enforced by the heavens, but various motions diverfly disposed in divers Seas, for which he gives many instances, some whereof we will beere relate, First going about to disprove Sca-

Scaligers opinion and experience, hee brings the experiment of the Portugall Nauigatours, who teftifie that they came from Mosambick on the fide of Madagascar into Malebar in 28, fomtimes in 30, other times in 35 daies: which is farre from the accompt of Scaliger, who would not have aship to passe it under three moneths, out of which he labour'd to proue this motion of the Sea, because the shippe was longer a going then returning. The second experiment he takes from the observation of one John Empolins, who willng to passe from the port of S'. Blasins, which is beyond the cape of good hope in Africk to Melinde towards the Indies, could not goe forward by reason that the currents, (as they call them) drove them back from Molinde to Pate, a towne by this fide of the Indyes: whence he would conclude that the Water should in this place rather runne from West to East towards the Indies. The third experiment is drawne from the testimony of Thomas Lope, who when he was to passe from the Cape of good hope towards the Indies, testifies that the current of the Water was fo violent, that it oftentimes leapt into the fore part of the shippe. The fourth is from the testimony of Iohannes Gnieranns, who putting forth from Tider, came into Spaine before the fixteenth moneth: This iorney from Tider to the cape of good hope, containes s s leagues, which makes 1650 miles: from this to the Iland of St. Helena by the relation of another pilott are 1400 miles: from whence to the Equinoctiall circle are 1600 miles: from hence to Spaine by the computation of degrees, are not about 1 720 miles: of all which the fummeis, 71 14 Now if we take out of fixteene moneths 49 dayes, wherein the ship against the cape of good hope, was carried hither and thirher (which the mariners call Voltegiare) & 70 other daies wherein it flood fill in the coasts of Guinea in Melacia, there will remaine a whole yeare spent in this iorney: which dayes if we divide by those 71 14 miles, there will be allotted to euery day no more then 19 miles. which evidently shewes that this journey was most short in respect of the swiftnesse of the Nauigations. For if the Ocean should drive his currents

to S: Helena even to the west, they had ended their journey in a far leffer time, because those currents (as they fay) carry the ship. But this journy was accomplished very flowly: wherefore the currents were not carried from East to West, as Scaliger relates. Likewise from fundry other experiments, he goes about to proue that it constantly cannot be observed to flow from North to South, as the said Scaliger affirmes, but that it is various according to divers places. Neuerthelesse, that the Sea should have a perpetual current from the Poles towards the Aquatour, seemes to stand aswel with Reason, as Experience: For all men must needs consesse, that the motion of the Heavens under the Equatour, must be much swifter then nearer the Poles, because the circles of it are greater neare the Equatour. Now by howmuch swifter the motion of the Heauen is, by so much more is the Rarifa-Ction of the Aire, or other Elementary bodies right under it: whether it be Aire (as it is most probable) or Fire as Peripateticks imagine, : But howfoeuer we determine that controversie, it must uceds be that the Arremust suffer Rarefaction, answerable to the swiftnes of the motion: if not immediatly by the swift motion of the Heauens, yet by a consequent by the greater feruous of the Sire, which under the Aquatour must needs be greater and of more force then about the Poles: whence the parts of the Aire vnder it, must partake more degrees of Heat, and by necessary consequence suffer a greater Attenuation, 2 The Sunne-beames being darted perpendicularly, cannot choose but attenuate and rarific the Arremore vader the Line, then in places more declining to the Poles. This ground thus laide, these two consectaries will follow: I That the Aire thus attenuated, must needes take vp a larger place then it before possessed, which cannot be but by inlarging it felf towards either Pole, either North or South; whence the parts of the Aire in those places must be more thickned and condensated. 2 That these parts of the Aire carried towards the Poles, and meeting with the cold Regions of the North and South, must by condensation turne into water, and to fall down in Rame or Snewes; whence the Water

encreasing neare the Poles perpetually, must have a perpetual current towards the Equatour, where they are againe exhaufled in vapours by the Heat of the Sunne; in such fort, that afwell the parts of the Sea betwixt themselves, as the waters in regard of the Aire, may proportionally maintaine themselnes by mutuall transmutation. To this reason some have added another, that the Sunne fojourning in the Southerne Signes, is nearer to the Earth, then when he is in the North, by the whole Latitude of his excentricke, and therefore of greater force to draw the water toward the South: But whether this Reason be of any great force, I will not spend time to dispute: let euery man vie his own judgment. It feemes to me a conje-Aure not improbable, that these currents may be also varied according to divers feafons of the yeare; as also according to diuers channels, by diuers croffings and doublings of the Tides, as we find in diners places : but I will not be too bold in this opinion, because I loue not to walke without a guide in thefe vncertainties.

4 Of the Naturall motion of the Sea wee haue spoken: It remaines we speake somewhat of the Violent: The Violent motion is that which is stirred vp by windes.

The consideration of windes is either absolute or respective: Absolute I call that wherein the Naturall effects and properties of the winds are handled; which properties belong to the naturall Philosopher, they being (according to Ariston.) a Naturall body unperfectly mixt: The Respective consideration is that wherein the windes are considered in respect to the Terrestriall Globe. This Respect is again twofold, either in regard of the whole Spheare of the Earth, whereof they designe out the points of the Horizon by certaine lines called Rhumbes; or else in respect of the Sea, to which they give a motion. The sormer respect we have handled in our first book of Geographie: The later is more proper to this place; & how-societ the wind is an exhalation, common as well to the Earth.

as to the Sea, affecting both with some alteration; yet because it more nearely affecteth the Sea as his proper Prouince and Dominion, and hath for the most part bin most observed of Sea-men and Marriners; Wee thought fit to treat of it in this place. Of windes some are uncertaine and various, which in all places interchangeably supply their turnes, keeping no certainty or regularity in times or places: others are called set or standing windes, because they are observed to blow at certaine times and places: of both which, assuch as concernes our purpose, we shall speake in these two Theorems.

To some certaine places, at certaine times belong certaine windes.

These winds are by some, called Anniversary because they blow at a certaine scason enery yeare; of these there are many kinds mentioned by Nauigatours. The first and chiefest is that which they call the Etelian winde, which is observed to blow every yeare from the Northeast about the rising of Dog-Rarre, and oftentimes continues about 40 daies. This wind drives the Seas from Ponens into the Egean Sea, even for farre as . Egyps. In the second place may wee range such windes as are called Chelidonian, because they arise at the first comming of the Swallowes. It bloweth somtimes from the Direct west, so that of some it is taken to be the same: Somtimes from the North west, so that with others it is accounted among the North winds: These Chelidonian winds driving from the North or North-west fill all the Mediterranean even to the coasts of Syria and Palastine, and continue in the fummer time for many daies together. In the third place may we accompt that winde, which Columbus perceived on the coast of Portugal comming over the Atlantick Ocean, which at some times of the yeare was carried higher, at other times cl:aving (as it were) to the bosome of the Sea, whence he probably coniectured that it was derived from some moist land, whereon he adventured on the first search of America and laied the first worke of that discovery. Fourthly to these winds

his

wir ds may be reduced those yearely flowings of the Perfan and Indian Seas, which the Portugall marriners call motions. The Persian Sea suffers such a kind of motion every yeare while the funne runnes through the Southerne degrees, and when he arrives at the end of Sagistarins it is shaken with an extraordinary great tempest: On the contrary side the Indian Sea, while the Perfien is moued, is observed to rest without any great motion; and when the Perfian is still, it fuffers great motion, especially when the Sunne first enters into Canser. This last motion seemes to be not only derived from the Provincial windes, but some other concurrent causes: whether these winds are the cause of the currents before spoken of, is a very disputable point, which I leave to others to fearch out. Of every fet winde blowing a part of the yeare on the coast of America, Acoffa treats at large, to which he ascribes the currents forespoken of in this chapter.

2 The violence of winds makes the Sea sometimes in some places stranscend bis ordinary bounds.

How farre the sea by violence of windes hath trespassed on the land, many haue learned to their greate loffe and calamity. It is observed somtimes in the Venetian shores, that the Sea driven with winds swels so high, that overstowing all the banks and channels, the Inhabitants are enforced to row in boates from house to house: Their cesternes are infected with Salt-water, and their pretious waters in vaults and cellars fpoiled. The like hath heeretofore beene found (if we will eredit Histories) in the Belgick Sea, on which the Northwest windes blow with fuch vehemency and so long that it brake downe the ordinary banks; and in Zealand and Holland fivallowed up many townes with infinite multitudes of people. Which seemes to be warranted by a report, I have hard of many travailers, that in a calme tide the topps of towers and Geoples have beene feene aboue the water. Befides thefe instances, we may adde the testimony of Strabo and Aristotle in

his booke de mundo: with divers other relations of strange inundations whereof we shall have more occasion to speake heereaster.

CHAP. VII.

Of the Depth, Situation, and Termination of the Sea.

He Absolute proprieties of the Sea being hitherto passed ouer: wee will consider next the comparative: which agree to the Sea no otherwise then in respect or comparison with the Earth, which are chiefly three; I Depth, 2 Situation, 3 Termination.

2 The Depth or Profundity is the distance betwixt the Bottome and the Superficies of

the Water.

To find out the Absolute depth of the Sea, is a matter of the greatest difficulty, and by many thought impossible, in respect as well of the immensity of it in many places where no line could touch, as of the various places, too many to be searched out by mans industry: yet where absolute science sales, there probable connecture takes place, and is best accepted, which we will venture to propose in this our Theorems.

I The ordinary depth of the Sea is commonly answer

answereable to the ordinary hight of the maine land about the water and the whirle-pooles and extraordinary depths answere to the hight of the mountaines about the ordinary hight of the Powley.

nary hight of the Earth.

It hath bin a common received opinion among ancient Cosmographers, that the depth of the Sea being measured by a line and plummet, seldome exceeds two or three miles, except in some few places neare the Snevian shores, and some places about Ponem observed by Pliny. But as Breerewood a worthy late writer obserues, this position is not to be viderflood generally, but only of the depth of the Streits or narrow feas, which were perhaps only fearched by the ancients who dwelt farre from the maine Ocean: But another accompt is necessarily to be given of the maine Ocean. This being a mater of great vncertainty, we will follow the conceit of the forenamed Author. It hath bin shewed in the former Chapter, that the most probable opinion concerning the manner of the first separation of the dry land from the waters, would have the Earth by the Creation to be cut into divers fluces & chanels, apt to receive Water. Now these materiall parts of the Earth, being taken out to give way to hollownes, were not veterly annihilated, but by an almighty hand fer in some other places, making by their addition the superficies of the Earth in fuch places higher then before: whence by reason it feemes to be collected, that the ordinary Eminency of the hight of the Earth about the Waters, should be answerable to the ordinary depth of the Sea. And if Hills and Mountaines be compared, we may fet them against the Deepes and extraordinary Whirle-pooles and Gulfes: And so betwixt the Sea and Land, and the parts of the one and the other we may fetle a kind of agreement and proportion : In a matter of fo great vacertainty, no man will expect an euident demonstration.

The Site is the position of the Sea in re-

spect of the Earth.

Concerning the fite of the Sea in respect of the Earth, we must consider the Water and Earth two wayes: First Absolutely as they are Elements and solide Bodies; Secondly, in respect of the sweetsies of either: if we consider the whole solide Body of the Water as that of the Earth, we must consesse without all doubt, that the Water bath the higher place, being lighter then the Earth; of which situation we have spoken in the first booke: for although some parts of the Earth are thought (by most, as we shall prove) to be about some parts of the Water, yet is this of no sensible proportion in respect of that vast Masse of Earth, couched under the Waters betwixt them and the Center of the World. But the question is here of the superficies of the Water, compared to the superficies of the Earth uncovered, which should be higher in place; of which shalbe this Theoreme.

The superficies of the Sea is some-where higher then the superficies of the Earth,

fome where lower.

Therehath bin a great dispute among Philosophers concerning the position of the Seain respect of the Land, whether it be higher or lower: fome have bin of an opinion, that the Water is higher; which opinion was defended by Tully in his Book De Natura Deorum, where he faith, that the Sea being placed about the Earth, yet coueting the place of the Earth, is congregated and collected, neither redounding, nor flowing abroad: which afterwards feems to be feconded by divers learned divines, who reducing most things to the supernatural! & first cause, divers times neglected and over-slipt the second. Hence S. Bafil in his 4 Homilyon the Hexamiron, left the water (faith he) flould ouerflow & spred it self our of the place it hath occupied, it is comanded to gather it felfe together: otherwife what should hinder the Red Sea to ouer-flow all Egypt, being lower then it selfe, vnlesse it were manicled with the Creators power, as it were with fetters: to which also afterwards feeme

sceme to subscribe Aguinas, Dionysius, and Catharinus, with divers other Divines, who held that the first discovery of the Earth, and the gathering together of the Waters in the first Creation, was made not by any mutation in the Earth, but by a violent accumulation of the Waters, being (as it were) restrained and bridled supernaturally, that they could not transcend certain limits and bounds. To confirme this opinion, some reasons are alleaged by moderne Philosophers: first because it is the order of all the Elements amongst themselves, that the Earth, as the heaviest, should take the lower place, and the water should ascend aboue: Secondly, because Marriners comming from the maine Ocean to the Land feeme to fee the land far lower then the Water: Thirdly , they alleage that place of lab, where God himselfe professeth, that he hath bounded the Waters, in these words: Hither to Shale thou come, and no farther, or here hall thy proud wanes be flayed. But this opinion feemeth very improbable, that God in the first institution of Nature, that God should impose a perpetuill violence vpon Nature : fith we fee the Creator in'other matters to vie Nature as his ordinary servant, and to administer the Regiment of things by second causes. Neither were the authority of these Divines so great in these Colmographical conceipts, to overfway thele of the fame profession? who could more exactly judge of these matters. Neither are these reasons of so great validity as to enforce affent. For first whereas St Bafill learnes to wonder why the Red Sea should not overflow all Egypt, if it were not supernaturally bounded; he takes that as granted, which is the question in controverlie, that the Water is higher: for which he can produce no other reason, then the Tethimony of the sense: but this is very weak, foralmuch as in such matters the sense is oftentimes deceiued, as stands well with the grounds of the perspeltimes: for (as we are there taught) two Parallels will in the end sceme to concurre fo far as the fight can judge: Now the Spheare of the Heavens, and the Sphæricall fegment of the Waters being parallell the one to the other, will necessarily seeme to concurre in the end: whence it must needs come to paste, that 0 2 tho

that part of the Sea must seeme to lift it selfe higher, and contrary wife the Heanens will feeme somewhat lower then indeed they are: and this I take to be the true cause why the Sea being seene a great way off, may appeare raised about the land whereon we fland. Another reason may be given from the perpetuall Refraction of the v. suall Lines comming from the Sea to our fight. For the Aire neare the Sea being alwayes intermix, d with thick watrish vapours rifing vp, the Sea must of necessity be presented in a thicker Medium by a refraeled fight: whence cofequently it must feem greater & higher then indeed it is: for as the Opticks teach, allithings frem greater & higher in a thicker Medium. To the other three Kealons brought to confirme this affertion it is no hard thing to an-To the first which would out of the order of the Flements inforce, that the Water is higher then the Earth; I anfwere (as before) that if wee intirely confider these Elements amongst themselves, wee must give the hight to the Water: foralmuch as the greatest part of the Earth lies drowued; for that aboue beares no sensible proportion in respect. of the parts of the Earth vncouered. But here we compare not the 2 Elements intirely betwirt themselves, but the Superficies of the Water with the parts of the Earth vicouered, habitable: which Superficies of the earth notwithstanding, this reason, may be higher then the Water: Secondly, where they produce the testimony of the fight; for my own part, I can warrant no such experience, having never launched farre into the deep: yet if any fuch experiment be avouched, it may casily be answered out of opticall Principles: that coming out of the main O. ean towards the land, by reason of the spherical convexity of the water, interposed between our fight, and the lower part of the land, those land parcels must needs feem less. as having some parts shadowed fio our fight: whence it must confequently appeare lower, as couched almost under water. Fro the 3d reason grounded on Scripture, whereon our divines feem most to depend, nothing else is concluded, but that Almighty God hath fet certain bounds & limits which the Waters should not passe: These bounds & lunits I take not to be fuper-

supernatural, as if the water restrained by such a power should contain it felt within it's own circuit : But naturall as clifts & bils, within which, the waters frems intrenched. This opinion therfore being difliked others have laboured to defend an oppolice polition, that the water is lower then the Earth alt gether: which opinion beares more colonancy with the doctrine of Frist. & most of our modern Philosophers. The reaso w hereon this affertio is grounded, be chiefly thefe: I If the Seatwere higher then the Earth, what should hinder the water of thro flowing abroad, & ouerwhelming the Earth: figh all men will confesse, that the water is by nature disposed to moue downwards to the lower place. If they have recourse to supernatural bouds, besides that we have spoken cocerning the interpretations of such places of Scripture, as scem to favour this opinion; we answer as before, that it is very improbable, that God in the first creation should impose such a perpetuall violence: fecondly, we read that in the vniverfall deluge wherein all the world was drouned, God brake open the springs of the deepe & opened the Cararalts of heaven to powre down raine continually many daies together you the Earth: Of which there had beene no necessity at all; had the sea beene heaped vp in fuch fort as they imagine: For the only withdrawing of that hand and letting goe of that bridle which gaue the Water that restraint, would have beene sufficient to have overwhelmed the whole Earth. The second reason is taken from Ilands in the fea, which are nothing elfe but parts of the land raifed vp about the water. Thirdly we find by experience, that a ship carried with the like winde is driven to fwiftly from the port into the open fea, as from the fea into the port, which could not be donne if the fea were higher then the land: for it must needs be, that a ship if it were to be carried to a higher place, should be moved flower then if it came from an higher to a lower. Fourthly all Rivers runne into the fea from the inner parts of the land which is a most evident figne, that the land is higher then the lea; for it is agreeable to the nature of the water to flow alwaies to the lower place, whence we gather that the sea shore, to which the Water is brought from the land, must needs be lower; otherwise the Water in running thither, should

should not descend but ascend. This opinion I hold farre more probable as being backt by reason, and the Authority ofour pelt Philosophers: yet not altogether exactly true (as we shall show heareaftet.) But Bartholomen Keckerman a lace German writer holding these 2 former opposite opinios (as it were) in one zquall Ballance, labours a reconciliation. In a diuerfe respect (faith he) it is true that the sea is higher, and that it is lower then the Earth. It is higher in respect of the stores and borders, to which it so comes that sensibly it swels to a Globe or a circumference, and so at length in the middle raifeth vp it felfe and obtaines a greater hight then in thote parts, where in the middle of the fea it declines towards the thore: Of which parts the hight fuffers fuch a decrease, that by how much neerer the shore they shall approach, by so much the lower they are in respect of the shore: in so much that touching the fhore it felfe, it is much lower then the Earth. For this opinion our Author takes as a demonstration: which he grounds on the 4 chapter of Aristotle de Cale, in his second booke, where he puts downethele two politions; which he calls Hypotholes, or suppositions; First that the Water no leffe concurrs to the making of a Globe or circle, then the Earth: for it fo descends naturally, that it doth sensibly gather it felfe together, and makes a swelling, as we see in small dropps cast on the ground: Secondly the Water makes a circle which hath the fame center with the center of the Earth: Out of these grounds would our Keckerman conclude the was ter in fome places to be higher, in other places to be lower then the Earth: And hence proceeds he to give an answer to their reasons who have affirmed the Earth to be higher then the fea: What to thinke of the proposition or conclusion we will shew heareafter, but in the meane space I hold this conclusion not rightly inferred out of these premises: For first whereas he faieth that the water by nature is apt to gather it selfe round into an orbe or spheare, I would demaund whether such a round body hath the same center with the world. or a diverfe center: he cannot fay that it hath a diverfe center. from the center of the Earth; First, because (as we have de-

monstrated in our first part) the Farth and the Water have but one center: and that the Water is concentricall with the Earth: Secondly from the second proposition or ground of his, out of Aroftotle; if he meanes fuch a sphericity as bath the fame center with the center of the Earth: I amwer, first that he contradicts himselfe, because he gives an instance in small dropps cast on the ground, whose quantity being so small, and convexity fensible, can in no mans judgement be concentrick to the Earth. Secondly, out of this ground that the Spheare of the water is concentrick to the Earth, he confutes himselfe; for according to the principles of Geometry, In a Spheare or circle, all the lines drawne from the center to the circumference must be aquall. Then must all places in the circumference or superficies of a sphericall body be of aquall hight from the center, and by confequence the fea being fuch 2 Sphericall body, cannot have thating quality which Keckerman imagines it to haue: Wherefore some other demonstration must be sought for this conclusion. I will goe no further then that I have spoken in the former chapter concerning the figure of the Water: Where I have probably shewed it to be corricall; and out of this may be eafily gathered, how it may be higher then the land in some places, as of the middle of greater feas, where the head of the Cone is lifted higher; in other, lower; as in the narrow streits where the increase of the eminencie is also lesse. The grounds and principles of which we have laied before.

I The sea in respect of the Eurth is higher in one place then another.

Besides the naturall conformity of the Water to a conicall figure, (as we have fore-shewed) whence one part of the superficies must be graunted to be higher then another; we must needs in the sea acknowledge other accidentall causes which produce an inequality in the parts of the sea: The chessest whereof are the Equality of inclination in all parts of the water to motion: And the inequality of the channels and shores: whence it commeth to passe that the Water of the

fea being every where of it felfe a qually inclined to motion, is notwithstanding vnzqually received into channels, so that in fome place, hauing (as it were) a large dominion to invade as in the maine Ocean, it falls lower and evener: In some other places as streites or narrow se as, the water having a large entrance from the Ocean, but little or no passage through it. must needs swell higher, and so one place by accident becomes higher or lower then another: Which farther to confirme diverse instances may be alleaged out of moderne and ancient observations. For diverse histories give testimony that fundry Kings of Egypt by cutting the Ifthmus or narrow neck of land lying betwixt the red fea & the Mediterranean laboured to make Africk an Hand & opena passage fro one lea'to the other:but afterwards they were perswaded to defilt from their enterprise: Some fay, because they saw the red sea to be higher then many parts of Agypt, and heerevpon feared a generall inundation of all Agypt, if the passage were broken open: Others have delivered that they feared, that if the passage from one vnto another were broke open, and the red fea having a vent that way, the red fea would become so shallow that men might wade over it, and so insteed of making Africk an Iland, it would have bin more joyned to the Continent then before. Both opinions consent in this. that the waters of the red fea were by the perpendicular found higher then in the Mediterranean: Moreover it is observed that the sea on the west part of America commonly called Mare Del Zur, is much higher then the Atlantick Sea which bordereth on the Easterne part of it; which gaue way to the conjecture of some, that the Isthmus betwixt Panama and Nombre De Dies had bin long fince cut through to have made a passage into the Pacifick Sea, without sayling so farre about by the straits of Magellane; had not many inconveniences bin feared out of the inaquality in the hight of the Water. The like in aquality is observed by Verstegan in the sea betwixt England and France: For according to his coniecture. France and England being one Continent heretofore, and ioined by a parrow neck of land, betwixt Doner and Callais the

the water on one fide was higher then on the other: which he probably collects out of the fundiy flats and shallowes at this day appearing on the East fide as well on the coasts of Eng and as of Flanders, especially between Dover and Callis, called by some our Ladies Sands, about three English miles in length: Out of which and fundry other probabilities, he labours to proue that all the Low-countries were heeretofore enveloped with the sea; till such time as the narrow land being either by Nature or Art cut through, and the Water allowed a free passage, it became dry land; but this point we shall discusse hereaster in place convenient.

4 In the next place we are to consider the termination of the sea. The termination is the bounding of the sea within certaine si.

mites.

5 The Limit is the margent or border of land wherein any fea is circumscribed.

The fea is bounded by the land, as the land by the fea: In respect of which termination some seas are called Maine seas. others narrow. The mane feas are fouce; to wit, the Atlantick which taketh it's name from the mountaine Atlas, by which on the west side it passeth, and divides Europe and Africk from America. 2 The Etbiopian fearunning on the west fide of Athiopia. 3 The Indian Sea having the East Indies on the North. 4 Mare Del Zur or the South fea, ficuate on the South fide of America: Which foure in respect of other may be called Maine Oceans. The leffer feas are either called Creekes, or freites; A Creeke is a place where the water (as it were) embosomes it selfe into the land, having an entrance large from the Ocean, and most commonly streythed inwardly, but no passage through: A Creeke againe may be divided into the greater or leffer: Vnder the former in a large fense may we comprehend the whole Mediterranean sea: for as much as the lea from the Maine Atlantick Ocean PA

by an inlet is ingulfed into it, but findes no passage out any other way, howforver it invades a large territorie. The leffer Creekes are againe diftinguished into the Eafterne and Westerne: The chiefe Creekes found out towards the East are fixe in number. I Sinus magnus which lies betwirt Mangus and India extra Gangem reaching as farre as the region of Chale s. 2 Sin as Gangeticus which is comprehended betwire Aurea Chersonesius, an i India intra Gangem. 3 Sinus Canthi, commonly called Canthi-colous. 4 Senus Perficus, bordering on Pe fia, and called by Plutarch the Babylonian Sea. 5 Sinus Arabicus, which is commonly called the Red Sea. 6 Sinus Barbarious, which by Pliny is termed Sinus Trogloditions, & at this day Golpho de Melinde. The Creeks lying Westwardly are chiefly thef : First Sinus Sarmations lying towards the North betweene Denmarke and Normay, which is divided into Sinus Finnicus and Bodiens, which is called commonly the Baltick Sea 2 Sinus Granvicus dividing the Muscouites from the Corely Northward; it is commonly called the White Sea. 3 Sinus Mexic nus bordering on the city of Mexico in America, amongst these, some would number Mare Pacifica, ot Mare Del Zur: buethis we thought fitter to call a maine Sea, then a creeke, being extraordinarily large in quantity. A Strait is a parrow Sea between two Linds; of fuch Straits thefe were anciently knowne, to wit, I Freium Gaditanum, or the Striss of Gibraltar of , Miles diffance, dividing Spaine from Barbary. 2 Fretum Magellanich, tound out by Magellane, which diudes America Peruana from the Southerne land. 3 Fretum Anian, lituate betweet the welferne shore of America, & the Eafferne borders of Tartary. Besides these there have bin discovered 3 more, (to wit) I Fretum Devis, found out by captain Davis in the yeare 1,85, which lyes toward Greenland. z Fretum Nasovicum, or Waygate, neare Nova Zembla, disconered by the Hollanders in the yeare 1514.3 Fretum de Mayre found out by William Schouten a Bavarian, taking his name from I face te Marre, by whose aduice and perswasion he vn. derrook his voyage But some of these latter streits here mentioned, for ough: I know, may better be reckoned amon : A Creekes.

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Creekes, forasinuch as they have not as yet sound any passage through, though with great losse and danger they have often attempted the Discouery. Concerning the bounding of the Sea with the land, we will insert these Theorems.

I The Water is so divided from the dry land, that the quantity of Water is greater in the South Hemistheare, of Land in the Northerne.

That most part of the dy land is situate towards the North, will easily appeare by instance. For toward the North are placed the great Continents of Europe, Afia, almost all Africa, and the greatest part of America: But in the South Hemispheare, we find only a litle part of Africa and America, befides the South Continent, which we cannot imagine to be fo great in quantity, as it is painted in our ordinary Mappes: foralmuch as all places at the first discouery are commonly described greater then they are. The reason I take to be this, that the first draught is alwayes confused & vnperfect, wherein a Region discouers it selte vnto vs vrder a more simple fioure, neglecting curiofities; but after a longer and more exact fearch of any Region, will be found in many places ingulfed with divers Bayes, and valioufly indented; in fuch fort, as the boand Line compassing it round, making an inordinate figure, and leffe re ular, cannot contain fo much land as first it might seen e to promise. Moreouer we may further obf rue. that those places which in the first discovery have bin taken for the main Continent, or at least for some greater part of Land, have afterward vponmore curious examination, bin found clouen into many leffer Illinds: As in America, Cuba in the time of Columbus; and California of late, thought to be a part of the Con inent, and so described almost in all our Mapps; yet fince by a Spanish Chart taken by the Hollanders, d houered to be an Hand. The like instance we have in Terra del Fuogo, which fince the time of Magellan, washeld a part of the South Continent, till Schonten by failing round about

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it foud it divided from the main land by fretum de Mayre carrying the name of the Mafter of the ship in his discouerie." Neither is it much to be doubted, but that in that large tract delineated out in the Globe for the South-Indies, are contained many llands, divided one from the other by freites and narrow Seas, which must subtract much from the quantity of the dry land fo that of necessity it must be granted, that the Northerne Hemispheare takes vp the greatest part of the dry land as the other of the Water. Wherefore that place of Eldras where he faith. That Allmighty God allotted fix parts to the Earth, and the feaventh to the Water; must either feeme improbable, or suffer another interpretation then that of the ancients. For out of credible coniecture drawne from the view of the face of the Terreffriall Globe, we shall hardly collect fuch a proportion. In this comparison of the Northerne Hemi-Cheare with the Southerne, we shall find a kind of harm ny betwixt the Heavens and the Earth: For, as Traveilers report, the Northerne parts abound with more starres, and of greater magnitude then the other toward the South; fo the Terreftriall Spheare discovers vnto vs more continent, greater Hands, and of more note, in the North then in the South.

2 The whole Globe of the Earth is invironed round betwixt the East and the West with sea, dividing the North from the South.

To prove this Theoreme we need goe no farther then the famous voyages of Magellane, Drake, Candish, and Shouten; Whereof the first attempted, the first passage through Fretum Magellanicum, and gave it the name, though he could not out sue his intended iourney. The two next sollowed the same way, and the last sound cut a new passage through Fretum de Mayre, as we have sormerly mentioned. Whence we may cassily deduce this Corollary, that the Southerne continent, not yet perfectly discovered, is either One, or (which is most probable) many slands: for simuch as by sailing round about it, they have found it everywhere compassed round with Sea. The like may be coniectured of the other parts of the world, on the

the northern side, wherof we shal speak in this next Theorem.

3 It is probable that the Earth is compassed round with the water from North to South.

I know nothing which bath exercised the witts and industrie of the Nauigacours of our age, more then the finding out of a passage Northward to Cathar, and so to the Sast-Indies, which controversie as yet remaines altogether vnanfwered, and awaites the happinesse of some new discourry. In which difficult paffage, wherein many haue fpent both their lines and hopes, it may feeme enough for me to goe with their Relations; suffering my conjecture to flye no fart er then their failes. The reasons which I meet with in my flender reading, I will examine as I can, without partiality, and fo leaue euery man to be his owne Iudge. First then we must colider that the voiage to the Indies must be effected by either of these two waies; to wit, Northward, or Southward, To beginne with the South, it must be performed two waits; either by some vnknowne passage through the South-Continent neare the Antarctick Pole, or neare the Magellanefiraits. The former is most vncertaine, for want of discourries in those vnknowne and remote parts: and if any such passage were found out, it were litle advantage to our Countreymen, who have already a shorter and nearer way: yet no instance can be given to the contrary, but that this part being cloven (as it feemes most probable) into many leffer lands, may admit of fuch a passage: But in such vncertainties it is as easy to deny as to affirme. The second South paffage is found out by Nanigatours, which is either by the strant of Magellan it felfe, or elfe through the Straights of Mayre before-mentioned, which this Age of ours hath pur out of doubt. The third passage is South-east by the Cape of good hope, knowne vnto our East-Indian Merchants, and therefore as a matter vnquestioned, needs no further examination. The onely matter which troubles men in this Age, is the finding out of a passage Northward to Cathay, either by the North-east, or North-west; wherein we will consider two things:

things: I Whether it be likely, that any fuch passage should be at all? 2, whether this passage should be performed by the North-East, or North-West. For the former many arguments are viged which feeme to croffe this opinion, of a way to the Indies toward the North parts: For I. The manifold sitempts of the English and Hollanders, both towards the North East and North West, either altogether spent in paine. or failing of their ends, scemes to give large testimonie, if not of absolute impossibility, yet at least of the valikelyhood of any such discovery as is hoped, For what cost or dangers would not almost all the Marriners of our Northerne world vindergoe, to find to neare a cut to their golden Indies? and if by chance many of them mistooke the right way, yet would it feeme improbable, that later Nauigatours corrected by the former errours, should not after to many trialls and artempts, at length hit the mark. This reason sauours of some probability: yet comparing this with diverse matters of the fame kinde, would feeme to be of no great force. For the truth and right being onely one and the fame, is opposed by infinite errours: fo that it may feeme eafier to commit a thoufand errours, then once to hit the truth: Time and long triall beget many Inuentions, which afterward feeme most easy: infomuch that many men have afterward laught at their owne mistakes. Moreouer, for ought I can find in the Relations of most mens discoueries, the passage which they bught was too faire Northward towards the Pole; where being infested with cold, Ice, and other inconveniences, they were enforced to returne thence againe, having feldome had any opportunity to winter in those parts for want of victuals, or extremity of cold. A second reason against this North passage may bee drawne from the innumerable forts of beatts wherewith America is flored : for admitting this passage, we must needs grant America to be an Iland. Now it is certaine that Noah's Arke was the store-house and Seminary, not only of mankinde, but of all other perfect living Creatures. Againe, it is euident out of the Holy Scripenres, that the first Region

Region whereon the Arke was delivered of her burthen, was Ala. These grounds layed, I would demaund how fuch a multitude of bealts of al forts, should be transported from Aha to America, being supposed to be an Hand, and, and enerywhere divided by the Sea from other parts of the Earth: could thefe filly creatures of their owne accord fwinning from one fhore to another? but alaffe the Sea was too large, and thefe beafts too fearefull to adventure on fuch a voyage. And admit fome by Nature had bin fitted to fuch an action, yet were it very frange to imagine the fame effect of all, being of many kindes. What then? were they transported in thips? But Navigatio in those daies being an infant, vnfurnished of the Chartand Compaffe, durst not a venture into the Ocean fo farre out of fight of land. But to give the opposite part all reasonable advantage, admit the Straiter dunding Alia and America welevery narrow, and within kenne; was it likely that from hence they could by shipps transport so many kindes of creatures? Could we believe any man to be formad, as to carry ouer with him Lyons, Beares, Tigers, Foxes, and other innumerable forts of rauenous and inprofitable beafts, as pernicious to mankind, as other creatures feruing for his vie? If any were found fo foolish or malicious, yet were it very volikely he thould transport so many kinds. This argument seemes no more to concerne America, then most llands of the World. wherein we find divers creatures, not only feruing for the vie of man, but many unprofitable & hatefull to the Inhabitants: The meanes of this transporta ion is very difficult to finde. St August me with some other Divines have bin driver to a fupernaturall cause, asif Almighty God should performe this matter by the ministry of Angels, which answer we dare not vtterly reject, being supported by the authority of so great a Pillar of the Church : yet I cannot to eafily imagine, that God who yied naturall meanes for the preferuation of all liuing creature in the Arke, should have recourse to a supernaturall power in the propagation of thefe creatures on the face of the Karth; wherefore to me the reason would seeme better answered out of our ground which we shall proue hereas ere That

GEOGRAPHIE. The fecond Booke. 110 That Ilands were not from the first Creation, but afterward broken from the maine Continent by the violence of the Water: Hence it might come to passe, that such beasts as were in the parts of the Earth to broken off, have fince there continued by continuall propagation vntill this day; I mean of ravenous and huttfull beatt; ; because of the others leffe doubt can be made, but that they might be convayed from one Country into another by shipping, to serve the necessity of mankind. Here we fee that no argument as yet hath bin vrged fo strong against the North passage, but may with reasonable probability be answered. It remaines in the second place that we descend somewhat to particulars, to inquire whether this be to be effected either toward the Northeast or the Northwest: The Northeast passage hath heretofore bin attempted by many of our English Navigatours, but with vnhappy fucceffe: yet were not these voyages altogether fruitlesse; foralmuch as by this meanes, a way was found out to Ruffia. whence began the first trade betweene ours and the Russian Merchants: But that litle hope can hence arife, fundry reasons may be alleaged, the chiefe were of are thefe; I The dangerous tending of the Seythick Cape, fet by Ortelius under 80 degrees Northward, together with the perillous failing in those Northerne Seas alwayes peffred with Ice and Snow, seconded by diverse Bayes or shelves, mists, fogges, lorg and darksome nights, most adverse to any happy Navigation. 2 The observation of the Water, which is more shallow towards the East, which gives smal hope of a thorough passinge, because all Seas are fed with waters, and for the most part are observed to be more shallow towards the shore then in the midule: But where in fayling forward, any Sea is found to decrease in depth; it is a likely argument, that it is rather a

reasons, some have hereto foregone about to prove a passage by the Northeast to Cathay; of which opinion was Antony Ienkinson, whose reasons be well answered by St Humphrey Gilbert, which I will briefly touch, adding some things of mine own, as I find occasion. The first reason was drawne

Creeke, Bay, or River, then a Straite; Notwithstanding these

from a Relation of a Tartarian, who reported that in hunting the Morfe he failed very far towards the South-east, wherein he f und no end; which might give a likely coniecture, that it was a paffage throughout. But to this we may eafily antwere, that the Tartarians are a barbarous Nation, alto ether ignorant of Navigation, which neither know the vie of the Charte, Compaffe, or Celeftiall Obsernations; and therfore ina wide Sea know not how to diftinguish the North-east from the South-east: Besides, the curious search of this long passage must depend in better iscouerers then a poore Fi-Ther-man, who feldome dares adventure himfelfe out of fight of land; belides, the Fisherman judging by fight, could not fee about a kenne at fea, which will proue nothing in regard of fo long a distance. The second Keason vrged by M lenkinson, was this: that there was an Vnicorne's horne found upon the coast of Tartaria, which could not come (faith he) by any other meanes then with the tides in some Breight in the Northes I in the frozen Sea, there being no Vnicorne in all Afia, fauing in India and Cataia. To this reason I may answer with S' Ha phrey Gilvers many waies; I Wee may well doubt whether the Tartarians know a true Unicornes horne, or no: 2 It is not credible, that it could be driven fo farre by the Tide, being of fuch a Nature that it cannot fwimme. Tides run ing to and fro, would have driven it as farre backe with the Ebbe, 1s it brought it forward with the Flond. 4 The Horne which was cast on this coast, might be the Horne of in of firm Indiens, which hath but one Horne like an Unicorne in his fore-head, whereof there is g ear plenty in all the Nor h parts, as in Lappia, Norvegia, Finmarke, as Zeigler teffifies in his Hiltory of Seandra. Laftly, there is a fish which hath a Horne in his fore-head, called the Sea Unicorne whereof Martin Frobifter found one on the coast of Newfound land, and gaue it to Queene Elizabeth, which was faid to be put into her Wardrobe: But whether t be the same which is at this day to be scene at Windsor Castle, cannot tell. The third and strongest reason which was viged for the North-east passage was this: That there was a continuall current through the Frozen

Frozen Sea, of such swiftnesse, that if any thing were throwne into the water, it would presently be carried out of sight. To this wernay easily answer, that this strong current is not maintained by any Tide comming from another Sea, but by diverse great Rivers falling into this streight. In like fort we find a strong current from Maoris Palus, by Pontus Euximus, Simus Boshbarus, and along all the coast of Gracia (as Contarenus and diverse others affirme out of their own experience) and yet the Sea lyeth not open to any other Sea, but is maintained by Tanais and diverse other rivers: so in this Northeast point may this current of water be maintained by the Rivers Duina, Ob, and many others which continually fall into it.

Hitherto haue we treated of other paffages, either effected or attempted to Cathay and the East Indies. The last and most defired and fought in our time, is that by the North-west. This way hath bin often attempted, as by Cabor, Danis, trobifher, Hudfon, So Thomas Button and others, but as yet not found out. Neither hath it more troubled the industry of Marriners, then the wit of Schollers, which we shall find by discourses written of that Subject. The absolute decision of this controversie we must leave to Time: onely such probabilities as I chance to meet with, I will faithfully let down, to give encouragement to their deserving labors, who shall farther attempt the learch and full discoursy of this North-west passage. The Reasons I find veged, I may well reduce to three Heads: The first is drawne from the testimonies and opinions of ancient Writers: The second from the Relations and discournes of later Navigatours, from the time of Henry the fenenth, till our age: The third and last from the last and newest adventures of men of our time; either lately dead or huing. To begin with the first, we shall from the testimony of Plate in Timao, as also in his Dialogue called Critias, draw a probable argument: for there he makes relation of an incomparable great Hand, named Atlantis, of larger extent then Europe and Afia, which was fituate Westward from the streights of Gibraltar, and navigable round about. The Princes of this Iland (ac-

(according to Plato's report) heretofore extended their government ouera great part of Europe and & frica. To second which opinion of Plato, we shall read in Marinus Siculus his Hiltory of Spaine, that in the American golden Mines, discourred by Columbus, there have bin found certain pieces of Coine , ingrauen with the Name and Image of Augustus Cafar, which were afterward ient to the Pope by John Kufus, Archbishop of Consentium: whence a probable conjecture feemes to be grounded, that America in those dayes was both p opled and discourred. Now it appeares again not only by Plate, but also by the opinion of Marsilius Ficinus. Crantor, Froclus, and This Indans is witnessed in their learned Commentaries on Plato, that this Hand called Atlantis. fome coo yeares belore Plato's time, fuffred an extraordinary inundation, & was fwallowed vp by water: other like exaples whereof we shall produce many, hereafter in place convenient: admit ing these testimonies of antiquity, whereof we ought to cherish a reverend esteem, these consectaries will seeme to offer themselves by way of necessary consequence: I That this Iland Atlantis was the fame which afterward from Americus Vesputius got the name America: because we find no Hand in the Atlanticke Ocean which comes neare that greatnes and quantity affigned by Plato: 2 That this Atlantis or America in those dayes at least was an Iland, because they reported it to be Navigable round about. 3 It must stand with great reason & probability, that this land being an Iland before Plate's time, should be so still, if at least it come not neare to the nature of an Iland at this day, then before: For either this Relation of the overflowing of this land is true or false: If at all it deserves credit, more reason is, that i should be Nauigable round about then before: in somuch that the Water in this manner swelling high, would sooner free through and cause a passage, then make a stoppage. 4 This passage must of necessity be toward the North-West where America is divided from Afia by the streites of Anian, witch opinion seemes better warranted, for asmuch as we find it seconded by the descriptions of many Geographers of great Q 2 name

name and authority, as Gemma Frifins, Munfter, Aprile. Hunterus, Guicciardine, Michael Tramafinus, Franciscus Demongensius, Bernardus Pute uns, Andreas Vavafor, ? ramon tann. Peter Ma tyr, and Ortelin in his generall Mappe Who all have described America as an exact lland, setting downe all the coasts and countryes on the North West lea o America from Hoche laga as farre as Cape Paremantia; all tl efe learned men having with one voice efcribed or reported America for an Iland; He should shew but a slender of fleem of antiquity or faucur of too much felfe-concerte, who should offer to contradict. This first Argument I confeste founde out into lo many circumstances, seemes at hist fight to carry a great shew of truth; but vpon found examination will be found very defective, and vncertaine, carrying more probability in the conclusion, then the premisses dare to justify: How many Paralog smes and vncertaine grounds are involved in this reason, let my ingenious reader judge; I whether Plato's report of this Atlantis were a true Rel tion grouns ded on experience and observation, or a pleasant Fiftion derived from the Poets of that time, wher with the Grecian Learsing was much intected; 2 How comes it to be thought probable that Plate in those daves should be so exact in delineating out the boun les of this New-world, who was so ignorant in the old as to thinke Europe and Afia to be inferiour in greatneffe to America, which notwithftand ng be thought to be an Hand. 2: How should so famous a King as Atlas, stretching his Monarchie (as the Authors of this reason report) from America to a great part of Europe, and Africk, in that wast gulph of time, fle pe away with fo flight a men ion: That there was fuch a Prince as Atlas, I make no quaftion; ypon whose fame and greatnesse the Poets grounded that fiction of raifing up the vault of heaven with his shoulders : But whether this Atlas ever faw America, my reader must giue me leaue to make a doubt, The Ignorance of Nauigation in those times, wherein occasion had not brought to light the chart & compasse, ogether with the huge vallnesse of the Atlantick O. cean, will speake my Apologie. 4 The finding of come graned with

with the Image and infeription of Augustus Cafar in the American mines, feemes to me more judiculous then alithe reft: We find the acts and conquetts of Cafar and Pompey in Europe and Affa and some parts of Africk particularly set downe by the grave writers of that time: We find Augustius Calar for forne perty coqu fts against bubarous people, emblafoned by the Feets of that time to the highest pitch of their invention: we may observe the age whereas Augustus lived to be the flor fh and pride of all the Romane learning; and himselfe the . doll and subject of most of their poeticall flatteries; having the happineffe to be inneffed in the empire, in fuch a time wherein the Roman Monarchie having bin too much wounded with a civil differtion, was willing to admire her worst Physician: And can any man be so senslesse to imagine that the discovery of the golde world should passe away clouded in tuch a flattering a e, without any mention? could not so much as the name be registred to teach posterity the way to fo rich an Empire? For my owne part I can afcrabe this, (if the Hiffor e deferue credit) to nothing elle but the pride and imposture of the Spaniards, whom we observe in all relations to be a most ingratefull Nation, who admiring nothing but their owne greatnesse, have required their bett deferving bene actors with difgrace, and obloque; friung to raze out their names and memory to whom they owe the greatest glorie. Columbus was a Florentine and no Spasiard, and therefore must not deferue so much of Spaine as his golden Indyes: otherwise Augustus Cafars image had bin better loft then found; and the Bishop received small thankes for his Parafitick pielentation. 5: That America should ever suffer fuch a deluge as to be loft for fo large a time, wil former be admitted as a pleafant discourse in table talke, then purchase credit as a likely Hiftery: it feemeth to be doubted by Mersater a Great Geographer of latter times , inferiour to none before named, whether ever this tract of land were over whelmed with Waters in the general! deluge; which he was indn-! ced to beleeve out of the disparity of the Soile, Herbes, enfis, and Inhabitants with ours in Europe and other paits of the world:

world; This opinion I hold not found in Divinity; yet fremes it backt with more through of humane reason, then Flato's fable of this imaginary Atlantick Iland: Much more could I specke of the vincertainty of this first argument, were I not assaud to tire my Reader too much: But this Northwest-passage is a long voyage, and bath bin for a long time sought, and therefore I hope ingenious men will pardon my long discourse.

2 The second reason is taken from a Relation reported by Gimma Frisius of three Brothers, who in ancient time passed through this fraite into America: which accident gaue it the name of Fretum Trium Fratrum, by which appellation it is knowne at this day. This argument I take to be more weake then the other, as depending on vncertaine report, indebted I know not to what approved History: But where History is vncertaine, reasonable coniceture must challenge precedency: I will heere by way of doubt alke these few questions; whether these three Brothers before mentioned passed through this straite or not? If not, no good Argument can hence be grounded of fuch a passage: or if they passed through , I demaund whether they returned to their Country or not , to make a relation? If they returned not, how could fuch a report with probability be brought home vnto vs? 3 If they returned home, how could fuch a memorable Action be forgotten, and not committed to any certain History? especially in such a Monkish age, wherein out of ignorance and want of experience, the most petty Inventions were admired for great matters: The reason as yet makes me to suspend my judgment of Decision, till I find better.

3 The third reason drawne from antiquity, best vrged and husbanded by St. Humfrey Gilbert for this North west passage, depends on a certaine Relation of Indians in ancient time, cast by tempest on the coasts of Germany. Pliny relates out of a report of Cornelius Nepos, who wrote 57 yeares before Christ, that certaine Indians were inforced by violence of rempest vpon the Germane coasts, which were afterward presented by the King of Suevia, to Quintus Metellus

Celer,

Celer, then Proconful of France, whereupon Pliny inferres in his 2" Booke 66 Chapter, that it is no great wonder, though there be a lea North, where there is fo much moisture. To confirme this opinion of Pliny, and report of Cornelius Nepos, they produce the testimeny of the excellent Geographer Dommicus Marius Niger, who sheweth how many wayes the Indian Sea extendeth it telle, reciting the fame report of certaine Indians that were carried by tempest through the Northfeas from India, vpon the Borders of Germany, as they were following their Trade of Merchandize: The argument grounded upon these Testimonies will stand thus; These for :-named Indians arriving on the coasts of Germany, must come of neceffity either by the South-east, South-west; North-east, or North-west. The three other coasts seeme altogether improbable, and therefore this opinion of the North-welt feemes more worthy credit; first, they came not by the S utheast; because the roughnesse of the Seas, occasioned by stormie windes, and strange currents in those places about Cape bona Speranza, seconded by the smalnesse of their Cancas, wherein the Indians viually travailed, seeme to stand against such a long vovage: 2 They could not well come along by the shore of Africk, and so passe into Europe, because the windes doe there commonly blow Easterly off from the shore; so that the current driving that way would fooner have carried them Weferly upon some part of America, where they should by all likely coniecture, have perished in that great Atlantick - Sea, either in that huge and great Atlanticke Sea either by Ibipwracke, or want of provision in fo small a vessell. 3 If they had ouercome all these dangers which wife men would hardly take vp vpon trust: It seemes hard they should not have first touched voon the coasts of the Azores, Portugail, Spine, England or Ireland, before they should arrive at the coasts of Germany.4 For the reason before-named they could not come from the South-west, because the current which commeth from the East, striketh with such violence on the straires of Magellane, running with fuch swiftnesse into the Southfea, or Mare del Zur, that a shippe without great burden cannot

cannot without much difficulty arrive at our Westerne Ocean through that narrow fea: What then shall we imagine o an Indian Canoa managed by fuch volkilfull marriners? 5. To pro ue these men to be true Indians, and neither Africans nor Americans, leemes to be warranted; because the Inhabitants. of Africa & America neither had, nor fearce know other kinde of Boates then such as beare neither mastes, nor sailes; but fuch as are only carried along by the shores: except of latter times such as have bin instructed by the Turkes on the coasts of Barbarie, or by the Spaniards in America: This argument I confesse is wittily spunne out by my renowned country-man St Hamfry Gilbert, whose ability seemes to have made a haruch out of the stubble. Neuerthelesse in my conceipt it promifeth in the conclusion more then the premises can well warrant: For first it feemes not to me a matter so cleare out of question whether these ship-wrackt people cast in voon the coasts of Germany were true Indians for not; because so farre as my coniecture leadeth me being grounded on Historie, the name of Indians out of the ignorance of those times hath bin guen by the Romans to many other forraigne Nations farr distant; especially to the Ethiopians in Africk, which befide the testimony of diverse ancient Historians, too tedious to relate, may feeme probable out of that end of a verfe of Horace; Vitra Garamantas & Indos: whe e for iovning together two Nations fo seperat in place, the former being in Africk the other almost in the farthest verge of Asia, he seemed as ig wrant of the distance, as the people. 2 How should these Westerne inhabitants know these men to be true Indians, whose condition, place and language they never understood? 2 Why m ght not these men come rom some of the Hands in the Atlantick Ocean? 4 The reason against it, drawn from the current friking with fuch force on the frestes of Magellane, is contradicted by the experience of latter Nauigators: much more I could speake of this reason; but that I hold it better to cherish ah pe of such a passage, then by excepting against these ancient arguments to discourage moderne industrie.

Other probabilities may feeme to be drawne from the dif-

coveries of later Nauigatours fince the raigne of Henry the feventh, under whose protection Sebastian Cabot undertook the discoverie of the North-West coasts: In which he prevailed as much as the Alchymistes, who in feeking out the Philosophers ftone have often mift of their aime: yet by this meanes invented many rare and excellent fecrets, of vie, and admiration. That Cabet the same yeare discovered as much of the Northerne parts of America as Columbus of the Southerne. cut of my small reading seemes to me no great quastion, whence I cannot imagine that King Philip of Spain can in this Newfound world challenge a greater interest then King Charles of great Brittain: a Prince of those incoparable virtues, which may be thought worthier to own, then the other's to pretend to fo great a Soueraignty: For the latter voyages & discoueries of Davis and Frobiber (for ought I fee) promife scarce so much as Hope, which oftentimes flatters and deceives men with her best countenance. But if we take vp wares vpon trust, some will tell vs of a Portugall, who made a voyage through this Streite Northward, calling a Promontory within the same after his name Promontorium Corterialis; of Scolmiss a Dane, who passed a great part thereof: but the most probable in my coniecture, is that which S' Humfrey Gilbert reports of one Salnaterra a Gentleman of Victoria in Spaine. who was faid to have passed by chance out of the West Indies into Ireland, in the yeare of our Lord 1 568, who constantly averted the North-west passage from vs to Cathay to be thought navigable; and farther clated in the presence of St Henry Sidney, then Lord Deput v of Ireland (St Humfrey Gilbert being then present) that a Frier of Mexico called Andrew Vrdanetta, more then eight yeares before his arrivall, told him that they came from Mare Del Zur, through this Northwest Straite into Germany, and shewed Salvaterra (being with him at that time in Mexico) a Sea-chart, made out of his owne observation in that voyage, wherein such a passage was exprefied, agreeing with Ortelius his Mappe: moreouer this Frier told the King of Portugall in his returne by that country home-ward, that having foun I fuch a Northwest passage, he meant

meant shortly to make the same publicke; but the King earnestly increated him not to discover this secret to any Nation: for that (faid he) if England had knowledge and experience of it it would greatly hinder the King of Spaine and me. This relation I could willingly credit from the mouth of any other man then a Frier; of whole palpable lyes, and fabulous inventions in their flattering letters to the Pope, from both the Indies, we have sufficient experience. Neuerthelesse that future ages might not despaire of so worthy an attempt as the discouery of this passage, it hath pleased God to stirre vp the Spirits and Industry of two later Nauigatours, Hudson, and St Thomas Batton, who have revived the forlorne hopes of the former. For the particulars of whose discoueries I know not better where to referre my Reader, then to a curious Mappe not long fince fet out by our worthy and learned Profeffour M' Brigges: the arguments I collect from thence are these, exprefled in his own words; I In the bottome of Hudfon's Bay, where he wintred, the hight of the Tide was but two foot, whereas by the neareneffe of the South fea in Port Nelson, it was constantly 15 foot or more. 2 Moreover in Port Neljon. where S' Thomas Button did winter, in 57 degrees he found the Tide constantly, every twelvehoures, to rife 15 foot or more; and that a West wind made the Nose Tides equal with the Spring Tides; and the Summer following, about the latitude of 60 degrees he found a ftrong race of a Tide running fometimes Eastward, sometimes Westward. 3 To shew the land toward the South fea, through which we feeke to open this paffage, not to be fo far off as our ordinary Charts feeme to pretend, may be probably auerred, in that California heretofore supposed to be a part of the Westerne Continent, is since by a Spanish Chart taken by the Hollanders, found to be a great Hand; the length of the West shore being about 400 leagues from Cape Mendocar to the South Cape thereof, called Cape St Lucas; which may appeare both by the Spanish Charts, and by the report of Francis Gaule, whereas in the ordinary Charts it is expressed to be 1700 leagues. These Areuments, I confesse, have swayde my opinion, but not as yet ab-

solutely freed me from doubt. Three Queries I must leave for the learned to confider, and for the time to decide; I whether this relation of Mariners concerning the Bay of St Thomas Button and Hudfon be true or no? no man will (I suppose) centure me as vnmannerly for asking fuch a question, confidering how much many Navigatours, either by their miffakes or their industrious falsities have deceived mens credulities; the one is incident to mankind, which out of vncertain observations, or vanecessary deductions, from thence often drawes an ill consequence; The other, the ordinary policy of discouerers, who lest their Trausiles might bee thought fruitlesse. would at least promise hope in the reversion. How many relations have bin corrected by experience of later Navigatours. every one may judge. 2 Whether this strong Tide in Hadfons Bay comining from the West, were from the South-Sea, or from the North, betwixt the Continent and diverle Hands by an Inler, is not a matter as yet clearely out of doubt. Del Fuoro was heretofore supposed to be a Continent, till Schonsen in his discouery found it to be an Iland, and a large Sea beyond it roward the South. Likewise New found-land in all our former Mappes and Globes, expressed as a part of the Maine of America, is by later experience found to be an Iland: and why may not this happen in the other, that at the entrance into Hudfons Bay, the land on the right hand should be clouen into many Ilands; betwixt which the waters iffuing, should be turned in such fort, as it might seeme to proceede from the West: fith the Tides taking their beginning from the Maine Sea, and continued through some Straite, commonly followe the crooked windings of the Channell. 3 That Califormin is an Iland, it may (for ought I know) be well warranted: But the euidence drawne from the Spanish Chart, seemes rather to cherish hope, then perswade consent. In this which I have spoken of these worthy mens coniectures, I have rather expressed my doubts, then my opinion; esteeming not withflanding that doubt almost an Herefie, which should discourage any generous and deferuing spirit from a farther attempt of this North-west Passage.

CHAP:

CHAP. VIII.

Of Sea-Trafficke and Merchandize.

F the Internall Affections of the Sea we have spoken: It remaines now that we treate of the Externall: By the Externall I understand that which belongs to Sea-Trafficke, or Navigation.

2 Sea-Trafficke is a passage by Sea from one

Countrey to another.

It is not my purpose in this place exactly to set downe the Art of Navigation, being a matter requiring a special Treatise of it selteryer because shipping and Navigation, as External or ediacent Accidents, belong to the Sea as the proper subject; I could not altogether slip them over without some mention. In handling of which matter I onely propose to my selfe two things: first, the Author and efficient causes of Seavoyages or Navigation; Secondly, the End and Vses thereoft both which we will knit up in these two general Theorems.

1 Navigation first taught by Almighty God, was afterward seconded by the industry of

famous Meninallages.

The first invention of this excellent art we can ascribe to no other author then Godhimself, who first taught the Hebrens his shown people, and not the Ægyptians and Phenicians, as some have falsly imagined: For we read in Genesis that Noah

according to God's precept, made an Arke for the prefervation of himfeife and other living creatures from the deluge: before which we cannot learne that there was extant any fkill of Navigation: Of which we have many reasons and conjectures given by ancient writers. I Because in those times there was greater need of Citties then hipps; because citties are not made for thipps, but rather thipp for the vie of cittics. 2 Small or little commodity could in those times be reaped from other countries, lying as vet rude and vnpoffeffed without Inhabitants. 3 Some would have this to be a reason why God revealed not this art to the old wor dlings; because being ready to perish in the floud, no man might have meanes to escape or saue himselfe, which without doubt they would have attempted, had the art of Navigation bin known amongst them. Whence it is a probable conjecture, that this knowledge of Navigation was discouered first to Noah at the time of the Deluge: whose Arks resting afterwards on the mountaines of Ararat, gaue a prefident to other Nations neere bordering, in what manner shipps were to be framed. Whence it came to passe that the first to whom this skill was derived next to the Hebrewes were the Tyrians and Phanicians, Nations as well for the commodity of the place as Inclination to fuch bufineffe more accommodated to Navigation: For Tyre was a chiefe Mart-towne of Phanicia bordering vpon the fea. Which knowledge being derived from them to other nations gave occasion to Strates and Strabe to conjecture that they were the first Inventours of it, being not able through the want of holy writ to afcend higher. From the Thanicians was this knowledg derived to the Egyptians, as Fliny reports in his 7 booke and 66 chapter, when as yet this art was but rude and alcogether unpolished, as may appeare by the same Play; who testifies that they then began to faile in a certaine vessell called Ratu: which word how foener it now be taken generally for any ship, was originally interpreted to be made of Brames iovned together: In which kind of thip they are reported to have passed the Mediterranean fea, but especially the Red-fea, being fee out by

King Erithra. Then came this art from the Egyptians to the Grezians (according to Plany by Danans) who perfected this science, and made a ship in a more exact forme then he had learned amongst the Phanicians: whence Daniens was celebrated the first Author of this invention: it being a common error amongst all Natios to ascribe the first invention to him. who was the first discoverer of it to them, being able to derive it no further: Yet the Gracians being very full of fabulous inuentions have found out other Authors of this art; for Strabe in his 10 booke, gives it to Minos: others, as Diodorns Sien-Ins in his 6 booke, to Neprane; who is of opinion, that for this cause he was afterward translated into the number of the Gods. But this is certain that amough all the Gracians the Cretenhans were the first that excelled in this faculty. Whence grew that Proverbe: Cretenfis meseit Pelagus: 25 who should say nothing could be imagined more abfurd and ridiculous then that a man should be borne in Creet and have no skill in Nauigation: Others afcribe the first knowledge of making thips to Dadalus, a rare workman in mechanical occupations: From the Gracians afterwards was this trade communicated to the Iralians, amongst whom the Genevensians and Venetians most excelled. Of the Vonetians Skill in this marter, we read no other argument then their great riches and magnificent power, especially by the fea, which hath continued voto this day; whereof no other cause can be thought on, next vnto Gods prouidence. then their industrie in Sea-voyages. After these arose the Porsugalls who under the conduct and direction of Columbus an Italian, discovered America called the new-world, and gave example and excitement to many other Nations to adventure farther. Amongst which (by the testimony of our-landstb people) no Nation hath waded farther then the English, who under Drake and Candish have compassed about the world and left an aternall Trophic of their immortall fame vnto posterity. Yet can we not heere defraud the Low- country men of their due commendation, especially the Hollanders, Flowmings, and Selanders; who by their riches acquired by nauigation and extraordinary power at Sea, have kept in despight of the

the vsurping Spaniard these Provinces, sarre richer then at the beginning of their warres, and deserued that saying which was given to one of the Gracian cities, by the Oracle; That it was guarded not with stones, but with wooden walls. Thus much may suffice for the Authors and first Inventours of Navigation. We are now to speake something of the ends & vses of it, which may in generall be referred either to profit or pleasure: Both which are againe spread into many Branches; the most of which we shall comprize in this following Theoreme.

2. Navigation is very necessary as well for the encrease of Knowledge as Riches.

Necessity is vivally taken two wayes; either for an absolute need, without the which a thing cannot be: or Comparatinely for a conveniency, without the which a thing cannot well be: In both senses I may call Navigation necessary for a mans life; for to deferre the later, whereof leffe doubris made; it is certaine that many places are so poore, barren, and indigent of all fuccour and reliefe, that they cannot maintaine a populous Nation without forraigne commerce and traffick; especially in these dayes, where the multitude of men is increased to so great abundance : for the later, many arguments may be produced to proue the conveniency of Navigation, which no man of any judicious in fight can deny to be most strong and forcible. The first argument may be drawne from the Authors and Inventours of it, whereof we have spoken in the former proposition: for first (as wee have thewed) it was prescribed by God himselfe, who never taught mankind any thing idle or vnnecessary. It was embraeed and cherished by many Nations even till this day, which no doubt had long fince bin loft, had not vie and profit feconded the Invention. Neither is it probable that Almighty God should create that vafte Masse of Water, that it should be an Element for fishes to live onely, or that (as some guesse) it should somewhat mitigate the extremity and drouth of the Summe's hear: But that men should by this meanes have an eafie and ready way to communicate and traffique one with the other: which may appeare aswell by many Testimonies out of the facred Scripture, namely Pfal. 104. ver. 25. Efa. 26, ver. 1. 2. as also by the example of King Salomon, the wifest of all Kings, who by this meanes got great store of gold from Ophir to build the Temple, as will appeare in I Kings and the The second reason therefore may be drawne from the exercise of Merchandize, and transportation of commodities, which cannot be administred without Sea-voyages: first because greater store of Merchandize may be carried in a ship then in a Cart, Waggon, or any other Instrument ordinarily in vie. Secondly because in ships greater variety of wares may be brought from diverse places, to which a Waggon cannot without great difficulty approach, or not at all. Thirdly, because wares and such commodicies cannot so quickly bee convaied in the land from places farre distant, as on the seamor with so litle cott and charges. The commodities convaied from one country to another are chiefely three; It iffes and other matters necessary for apparell: villualls and food; Phyficall Druggs: all which no man will deny to be most profitable for the vse of mankind. Moreover it is not to be imagined that nature produceth such commodities only for the privat behoof of some one country wherein they grow: First because fuch commodities in some countries are found in such abundance, that the same place seemes not to need them: And nature were vaine, if the vie were not required. India mittit &bur molles sua thura Sabai. Secondly, because other Nations altogether want fuch things which abound in other countries: without the which notwithstanding they cannot well liue. A fourth reason may be drawne from the promotion of Religion & sciences, which cannot well be atchieved without Sea-voiages or Navigation. For the former we need goe no farther then the holy Scripense which gives large testimony of fuch voyages: In the old Testament as well as in the new, we haue recommended to all posterity the industrie of the Queen of Saba, who is faid to have come from the vetermost parts of the Earth to heate the wildome of Solomon: And how should tle

the Gospel of CHRIST have bin divulged to diverse Nations, had not the Apostles dispersed themselues, and passed the Sea in fhips, to convay their facred message to diverse Nations and Kingdomes? neither is it leffe euident in the propagation of Learning and humane Sciences: First, out of the example of many & tamous worthy Philosophers, who traueiled far to converse with learned men of other Nations, to enrich their mindes with knowledge. Secondly, out of the first propagation of Learning into our parts; which we shall finde (as it were) foot by foot to follow Navigation. Hence we fee that from the Hebrewes and Chaldees it was derived to the Tyrians; from them to the Egyptians; fo to the Romanes, and thence to most parts of Europe. A fourth reason may be taken from the necessity of transporting Colonies into forrain countryes: for as after the vniuerfal Deluge of the world, the people dayly encreasing, were enforced in tract of time to disperse themselues into diverse Countryes: so every Country lest to it felfe, and not much molested with famine, or devoured by warres, will at length grow too populous, vnable to fustaine it's owne weight, and relieue it's own Inhabitants. Whence it hath bin a policy practifed by most Kings & States in such cases, to make forraine expeditions, and send forth Colonies into other Countryes leffe peopled, to disburden their owne of fuch encombrances: as we see the Kings of Spaine to hance fent many into the West Indies; and we at this day discharge many Idlers into Virginia and the Barmudas. Here also is the Art of Navigation viefull, without which, the Seas could not be passed, nor forraigne Countryes knowne. Fiftly, Navigation teemes to be of greater importance for the defence of a Country against forraigne Nations; because Sea-fights are leffe dangerous and inconvenient to the Land, then Landfights. All these arguments have their force and life to prove the profit of this excellent Science. Many arguments may be drawne to proue the vie of it for pleasure and delectation; which being well vsed, hath his place amongst other of God's especiall bleffings. This delight will fire shew it selfe in the mutuall commerce and fociety with other Nations: Sith a min

man (as Arikotle affirmes) is by nature inclined to mutuall fociety, and cannot reape greater pleafure then in fach conjunctions: And as one Man with another findes folace; fo one Nation with another: especially in the variety of fundry manners customes, rites, and dispositions. Secondly, in the contemplation of wife Nature, who hath endowed divers countryes with divers Minerals, Plants, Beafts, and fuch commodities: then which variety nothing can be more delectable to an ingenious vnderstäding. To all which we may add as a Corollary, the Honour which hath bin given to Navigation by Princes and States, aswell of former as later yeares, In ancient times we read that Ptolomy Philadelphia, that learned King of Egypt, who furnished himselfe with fo rich a Library 277 yeares before CHR 15 T's Incarnation, gaue great incouragement to Navigation, and maintained the passage through Sinus Arabiem, or the Red Sea, by which the commodities of India and Arabia were brought to Alexandria, and from thence dispersed through diverse places of Europe, Asia, and Africa. This was afterward seconded and cherished by the Romans, at what time Egypt wasmade subject to their dominion: But the Roman Empire being afterwards rent in pieces by the Gothes, Vandals, Limbards, and Saracens, all traffick betwixt nations began a while to cease; till fuch time as the inconvenience being knowne, a new Mart was fet vp at Capha in Taurica Chersonesus, belonging at that time to the Genois: Thence was it derived to Trebizond, and afterwards to Samerchand, where the Indian, Turkesh, and Persian Merchants were wont to trade with the Venetians. This Art was afterwards fet vp and revived by the Sultans of Egypt, through the passage of the Red Sea, till such time as it was in a manner taken away by the Portugals, Spaniards, English, and Dutch; who have found out for themselves a better way by the Cape of good Hope, to the East Indies, and by this meanes much abated the Traffick of Alexandria, and the wealth of the Venesians. Neither in this Age of ours have there wanted great Potentates, who have not only endowed this Trade with great and ample primledges; but also themselves practifed fuch fuch commerce, as well for the benefit of their Common-wealth, as the increase of their particular estate. Two memorable examples we have in Henry the Third, King of England, and Laurence de Medices Duke of Florence, whereof the former gave many and large priviledges to all the Hance Towns in his kingdomes, which were in Number about 27: The other himselfe for his owne private commodity exercised the Trade of Merchandice: yet was this man most ingenious, and a great lover of learned Men.

CHAP. IX.

Of Pedography, Rivers, Lakes, and Fountaines in the Earth.

Ee haue formerly treated of Hydrography, or the description of the Water, now are we (by Gods affistance) to proceed on to Pedographie, which is a description of the Firme Earth, or Dry-land.

2 The Land is a space contained in the superficies of Earth, distinguished from the Water.

The Earth in this place is not taken as in the former part of Geographic for the whole Terrestrial Spheare, composed of Earth & Water: Neither yet as it is vsually taken in Naturall Philosophie for an Absolute Elementary body, whose causes & affections are to be searched out; but Topographically for a place or habitable space on the dry-land; This dry-land distinguished

guished from the Water by it's Firmnesse and Constancy, being not subject as the Water to motion and inconstancy, was therefore (if we believe the Poet) called Vesta; according to that verse, Stat vi terra sua, vi stando Vesta vocatur. Neither wants this table of Vesta a sufficient morall. First, because Ve-Ha was faigned to be a keeper and protectour of their boufes. which may very well agree to the Earth: which not only fustaines and beares up all buildings and houses; but also affords all commodicies and fruits wherewith housholds are maintained. Secondly, Vesta was fained to be the Goddesse to whom the first fruits were offered in facrifice; which may wel fquare with the nature of the Earth, from which all fruits are originally derived; and therefore (as it were of due) ought all first fruits to be confecrated to her altar. Two other Parallels betwixt the Goddefle Vesta are added by Natalis Comes: Fift. because Plutarch sheweth in his Symposiacks, that the Tables of the Ancients, dedicated to Vesta, were made round in forme and fashion of the Earth: Secondly, because the feat of Velta was imagined to be in the liquide Aire immoueable, and not subject to motion; which well agrees with the common conceiued opinion of the Earth. But their two rather expresse the nature of the whole Terrestriall Spheare, then of the land diuided from the Waters: This description of the dry-land separated from the Waters, we have termed Pedographie: because the Greeke most, commonly derived from es, a foote, fignifies as much as a firme place, whereon mea may have fure footing, to which is confonant the Hebrew word yns, which leemes most probably derined from 737, which fignifics as much as Terere, to weare out or waite : because the Earth is daylie troden and wome with our feet. The proprieties of the Earth appertaining to a Cosmographer, are many and various; wherefore to avoide confusion, we have divided them into these heads.

3 The Adiuncts of a Place in the Land are cither Naturall or Civill: The Naturall are fuch

fuch as are inbred in the Earth.

- 4 The Naturall may be againe divided into Perpetuall, or Casuall. Perpetuall are such as alwayes, or most ordinarily continue the fame.
- 5 The Perpetuall proprieties are again twofold; either Absolute, or (omparative. The Absolute I call such as agree to the Land without any respect to the Sea.
- 6 Of the former fort are fuch as belong to the Figurature of the Soile, wherein three things are most remarkeable: 1 Rivers, Fountaines, and Lakes. 2 Mountaines, Valleyes, and Plaines, 3 Woods, and Champian Countries.
- 7 A River is a perpetuall course of water from a certaine head or fountaine running from an higher to a lower place on the earth.

Rivers are by some Geographers more curiously distinguished into 2 forts: whereof the first are fetled or stayed Rivers, which flide away with a more æquall and vniforme courfe: The latter are called Torrents or flickle waters, which are carried with a farre greater violence. In a River three things are chiefely remarkeable: First the Fountaine or Spring: secondly Whirle-pooles: Thirdly the Month of it. The Ipring is the place, where at first the water sensibly breakes out of the

Earth: As Nilus in Africk is thought to haue his first head ac the mountaines of the Moone. A Whirle-poole is a place in a River, where the Water falling into a Deepe trench, is whirled and turned round: The Month is the place where any River finds a paffage out, either into the fea, or into another greater River; which in latin is tearmed offium or a gate: Whence they call Septem offia Nili: which are seven mouths, by which it falls into the Mediterranean. This gave the name to many Citties and Towns in England as Plimmouth, Dartmouth, Portsmouth, Axmouth, with many others. Now for almuch as all water is by nature heavy, and therefore covers the lowest place; The course of all Rivers must needes be from a higher to a lower place: whence we may guesse the hight of lands. For it is necessary that for every mile wherein the water glides forward on the earth, there be made an allowance of 2 toote at least in the declivity of the ground. For although water will flide away at any in quality, yet could not the water be wholfome, and retaine any reasonable swiftnes of motion without this allowance. Hence we may probably find out the huge hight of the Alpes about all the places in Europe: because out of them spring soure great Rivers, which runne foure waies; whereof the two greatest are the Danon (which receives into it 60 Nauigable rivers and fo difburchens it elfe into the Euxine Sea far remote) and the Rhene. Of Lakes and Rivers many memorable matters may be spoken: all which we will reduce to these heads. I Their Generation and first originall: 2 Their Appearance: 3 Their Place in the earth: 4 Their Vertues and effects; all which we will comprehend in thefe Theoremes following.

1 All Kivers have their first originall from the Sea the mother of Rivers.

The originall of fountaines and Rivers on the earth is a matter of great difficulty, and for ought I know, not yet found out of our greatest *Philosophers*; yet being willing to goe as farre as I can, I will glaunce at probabilities, and first fet downe other mens opinions. Some haue bin of opinion that

that in the bowells of the earth are hid certaine vast concavities and caverns, which receiving into them a great quantity of raine- Water, have given originall to Lakes and Fountaines. Hence they give the reason why these sountaines are perpetuall; Becaute the raine-water received into these caverns being extraordinary great, is sufficient to nourish such springs of water vntill the next winter; whence comes a new supply of more raine. These Rivers (say they)in the summer decrease, and fometime are dry, because of the defect of water, when the place is not great enough to receive sufficient water for the whole yeare. This opinion fermeth grounded on these reasons: First because we find by experience, that Rivers and fountaines are greater and larger in Summer then in Winter. Secondly because where there is lesse Raine, fewer or no Rivers are frene: As in the Defarts of Athiopia and Africk few or no Rivers are found: But in Germany, France, Britany, and Italy many Rivers shew themselves; because they abound in the moisture of the Aireand much fall of Raine. Thirdly amongst vs (we see by experience) in a hott and dry Summer they are much decreased from their ordinary greatnesse, or altogether dried vp; which is a great probability that their originall is from raine. This opinion if it be only understood of forne Rivers, may be probable; because some currents out of doubt take their originall from great showers or snowes, as at the foot of the Alpes and other fuch places, where the fnow dayly melts and feeds them: but if it be generally vnderstood of all Rivers, it is manifeftly false as may appeare by these reasons. First, because the Earth no where drinkes vp the raine farther then ten foot deepe in the soile; for the higher superficies of the earth is either dry and foeafily drinkes vp and & confum's the Water within that space; or else being already moist, it receives it not at all, but expells it by Rivers and channells: Secondly, some mountaines not couered with earth, but confisting of hardrock, notwithstanding send forth great store of fprings and fountaines, which water could not be received in, through a hard rocky substance. Thirdly, because in very dry places certaine pits being digg'd downe into the ground 2 hundred or threehundred foot deepe, will discouer many great streames of Water, which could not be from the receite of Raine. Fourthly, it cannot be imagined that so much raine could in a winter fall into one place, besides that which the drauth of the earth confumes, to nourish fo mighty and great Rivers in the Earth, as are Rivers running in a perpetuall courfe. Fiftly, all Rivers almost take their originall from some mountaines or other; as Danubius from the Alpes, and Nilus from the mountaines of the Moone in Africke; Which places being extraordinary high, are more vnipt to receive water, then lower places of the earth. To the reasons that they alleadge for their opinions, it is not hard to answere: That rivers should be greater in the winter then in the fummer, the cause may be better given; Because more moiflure of the Aire falls into the brinke from externall Raine or fnow in winter then in fummer; & the groud being moister, is able to drink leffe then at other times: which is also the reason why in hotter and dry Countries there is not such plenty of Rivers: for we deny not, but fountaines may fometimes be increated and sometimes diminished by addition of raine water: but that any fuch valt concavity should be vnder ground, as the receptacle of so much raine, and should nourish so many and fo great currents. The second opinion is of those who thinke that the originall of all rivers and fountaines is from the sea: Which conceit hath bin strongly fortified by many Fathers of the Church, and grave Divines of later time; which opinion is chiefly grounded vpon these reasons: First because it seemes a most incredible matter, that so much vaporous matter should be engendred under the earth, to feed such a perpetuall course of water: Secondly, if all Rivers should not be derived from the sea, no reason could be given, why so many rivers daily emptying themselves into the sea, the sea should not encrease, but continue in the same quantity. Thirdly to this purpose they vrge the place of Eccles: 1. All rivers runne into the sea, and yet the sea is not full: To the place whence they came they returne, that they may flow againe. But this opinion feemes to be shaken with a great difficulty. For it is a hard

hard matter to conceive how the water of the feabeing by nature heavy, and lower then the superficies of the earth (as we have demonstrated) should ascend into high mountaines; out of which we find fprings of water oftentimes to arise: for eitherit must ascend Naturally or by Violence; not naturally for the foresaid cause; because it is a heavy body: Is violently. they must affigne some external! Agent, which enforceth it to this violence. This difficulty diverse Authors have laboured diverte waies to falue : Some amongst whom the chiefe was Theodoret, have fled to a supernaturall cause in Gods providence; as though the water in it's own nature heavy, should be notwithstanding enforced to the topps of the mountaines; But this opinion seemes very improbable; because, although we cannot deny Gods miraculous and extraordinary working in fome things; yet all men have supposed this to be confin'd within the bounds of nature: And very strange it were to imagine that almighty God in the first institution of nature should impose a perpetuall violence vpon nature. Others, as Bafill, have thought that the fea-water was driven vpwards towards the tops of mountaines by reason of certaine spirits enclosed in it: Mare (as be faith) fluitans & permeans per cuniculos fistulares & angustos, mox vbi obliquis aut certe resta in sublime surrectis excursibus se occupatum deprebenderit ab agitante compulsum spiritu, superficie terra vi difrupta erumpit ata, for as emicat; The fame opinion almost in every respect is ascribed to Plato in Phadone, & Pliny 2 booke. 65 chap. Quo (inquit) spiritu, actu & terra pondere expressa siphonum modo emicat, tantog, a periculo decidendi abest ut in summa quoq et altissima exiliat: Quaratione manifestum est, quare tot fluminum quotidiano accessu maria non crescant. But this exposition will hardly fatilfy him who defires to fearch farther then obscurity of words: For first by admitting spirits as movers of the waters, they feeme to fall into a Platonick opinion before examined of vs concerning the heat of the fea-water. Secondly, I would demaund whither fuch ipirits in the water to which they afcribe this motion, be Natural Agents or Supernaturall, or Violent: They cannot be natural Agents: For afmuch

asinuch as they are supposed to drive and enforce the water against his owne nature. For by nature (as all men know) it is apr to descend; whereas here it is supposed to ascend by reafon of fuch spirits. They cannot be violent agents because they bee perpetual; whereas no violent thing can be perpetuall. Thomas Aguinas being defirous to shew, how much fountaines could ascend out of the sea-water varies in opinion from the former, and imagines that the fountaines and Riverw ter is dr. wne vpwards through the force of Caleffiall bedies, for the common good; to wit that it might water aswell the mettalls in the bowells of the earth, as give moisture and nourishment to Plants, and living creatures, dwelling thereon. And this motion (faith he) although it be against the particular nature of the water, is not altogether violent: because elementary bodyes are bound by a certaine law to obey and fubiect themselves to the heavenly; so that motions impressed by them, are not enforced on them by violence. For albeit in fome fort it thwart the physicall disposition; vet haue all creaa tures an obediential aptneffe (as they terme it to fub mir themselves to the superiour. But this opinion of Thomas Aquinas (in my conceit) feemes leffe found then the former: For first Thomas had no need at all of these shifts, holding some of his other grounds: For in another place, comparing the hight of the fea and land one with the other, he firmely maintaines that the sea is about the land, and that it is bounded and restrayeed from overflowing the dry land, by the immediat power of the Creator: If this be graunted, what need there any afcent or drawing up of the water, by any external power of the heavenly bodyes: fith the remitting of this restraint of waters in some places, were sufficient to cause such springs and rivers in the earth: Secondly, his opimon cannot flind without mamifest contradiction of himselfe; for how can the water, being of his owne nature heavy, be drawne vpward without violence and thwarting of nature. And whereas he alleadges for himselfe an obedientiall aptnesse in the elementary bodies to obey the superiour, he sha I find very little help to maintain his part. For this obegien in linelination must be either accore ding-

ding to the nature of the water, or opposite vnto it, or at least the one must be subordinat vnto the other: That it is according to the nature of the water, he himfelfe disclaimes, and experience refutes; because it naturally descends, not ascends: it it be opposite (as indeed it must needes be) he contradicts himselfe: If the Physical and obediential inclination be suberdinat the one to the other; I vige that subordinat causes can produce no other then subordinate effects; for afu uch as the causes and the effects are measured and proportioned the one by the other. But wee plainly fee that the mo ion of afcent or defcent are diametrally opposed, and con rary the one to the other; fo that they cannot otherwise proceed, then from opposite and contrary causes. Secondly this obedientall aprieffe, is commonly understood of a creature, in ref est of his Creator, in whole hand it is, as to create all things o'nothing, fo to reduce all toings again into nothing. But this although it be about nature, yet no way contradicts nature; and eafier it is to be imagined, that the Creator should annihilateany Creature, then letting it remaine in his own Nature, give it a motion against nature: Moreover if we duly conder nature in her course, we shall find hat the lower & elementall Bodies onely concurre to the confernation of the whole, and of one another by following their own private inclination: for the whole is nothing e'fe then an orderly concent and harmony of all the parts; from whose mutuall cooperation, it receives his perfection; fo that where any part failes in his owne office, the whole must needs sustain dammage. Thirdly, it will hardly be refolued by any of this opinion, by what meanes or inft: uments the heavenly or superiour Bodies can have such an operature power ouer the water, as to life it vp ward from his owne Center: for neither can this thing be performed by motion, light, or any Influence, which are the three meanes of operation of coeleftiall Bodies on elementary: I will not fland to proue eurry particular in this matter: But onely would have my adversary to answere, and give an instance and speciality. Another opinion there is of Arifforte, followed by all Peripaseticks, who in his first booke of Meteors, and 13 Chapter, goes

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goes about to proue and maintaine, that all Springs and Wells in the Land are produced and generated in the bowells of the Earth by airy vapours resolued into water; which opinion he labouts to ftrengthen in this manner. It is certain (faith he) that the Earth hath within it much aire; because Nature will no-where admit a vacuity. But he Earth hath not onely miny open, but a great many fecret holes and concavities. which cannot otherwise be filled then with aire. Moreover a great part of the Earth, and other vapours therein contained, and stirred vo by the force of the Staries, are converted into Aire: and that aswell the Aire included in the bowells of the Earth, as vapours there also bred, are perpetually converted into water: This reason may seeme to perswade, because it followes of necessity, that the coldnesse of the Earth expelling their heat, they should harden & condensate, & be disposed at last to the generation of water : whence also the cause is given of the generation of water in the middle Region of the Aire, although it be not alwayes thence bred; aswell for other caufes, as for that the Aire by the heat of the Sunne is sometimes too hot, and the vapours are too much attenuated and rarified: fo that the matter of Raine cannot be alwayes supplyed. This would Aristotle have to be the the original of all Springs and Fountaines; So that the water should first diffill as it were drop by drop, out of this vaporous matter: and it is moift matter to collected and drawne together, thould aftrewards breake forth out of the ground, and lo cause such fountaines. Some reasons are also produced to proue this affertion; for (fay the Authors of this opinion) If the Springs and Rivers should proceed from any other cause, then they should take their beginning from Raine water, which is before refuted; or from the Sea by certain fecret passages, which opinion seemes too weake to endure examination: First, this seemes an argument, that the Sea water is commonly Salt, but the water of Springs and Rivers is for the most freet and fresh; and therefore fuch Springs are not derived from the Sea: Secondly, because we never find the Sea to be emptied, which must needes be, if it should give beginnings to all such currents of water

in the Earth; Thirdly (we have already fliewed) that the Superficies of the Earth is higher then the Water : fo that it cannot be conceived how rivers should be derived from the Sea. To this ppinion, howfocuer feering probable, and tupported with the name and authority of fe great a Philosopher, I dare not wholly affent; for almuch as it thwarts the Testimony of holy Se ipture, and cannot otherwise stand with reason: becaufe it cannot well be imagined how to many vapours, and fo continually, should be ingendred in the bowels of the earth. to nourish fo many and so great currents, as we see springing out of the Earth: for a very great quantity or portion of Aire being condensated and made Water, will become but as a litle dr p: The Aire, according to Ariffotle's grounds being by a Tenne fold proportion thinner then the W ter. Moreouer the Aire in these places scated in the Superficies of the Earth. and higher then other places, and by confequent neerer the Sun should rather be rarified and thickned; because heat is the greatest cause of rarifaction, as we shall shew hereafter: for the reasons alleadged for these opinion, they are drawne only from the weaknes of their affertion, which hold that Fountaines are deriued either from Raine water, or from the Sea: both which wee haue examined briefly, and whereof wee shall speake hereaster. The Schoole of Conimbra, not veterly rejecting all the former opinions, have undertaken to forge an opinion (asit were) partaking of all, pretending to fay fomething more, when indeed they produce nothing belides the former. Their Affertion they have fet downe in eight propofitions, which I will faithfully fet downe, and then censure. The first is that in subterranean places under the supersicies of the earth, is hid a great quantity of water, diffingui-Thed into Rivers, Ponds, and Lakes. This they proue from the daily experiment of fuch as d ggs diverfe wells and deepe trenches in the Earth; Who many times under the Earth, find not only many rivers and ponds, but many times happen vpon fo great abundance of Water, that they can neither find the bottome or bounds thereof. To this they add an experiments of Philip of Macedon recorded by Afeliphidorus WILL

who caused many men expert in digging of mettalls, to be let downe into an old and for faken mine to fearch out the veines of metralls, to lee where the covetoufnelle of antiquity had left any thing to potterity. These men ving great lights are faid to have found nothing there, but great and vast rivers and great receptacles of waters. This they also labour to confirme by many and toddaine eruptions and breaking out of waters out of the earth, whereof we shall have occasion to freake more heareafter. This first position, howsoever in it felfe true enough, seemes litle to the purpose; but we will proceed to the second, which is this: That when God in the third day of the Creation separated the waters into one place. and hiddit in the caverns and fecret receptacles of the earth; at the same time dispersed into diverse parts of the earth, a great quantity of water by diverse occult passages and channels, whence comes that great malle of waters vader the earth; which is before mentioned. This they feeme to perfwade by reason: for (say they) as the wife Architett of all for mans fake, and the rest of living creatures for the vie of man, hath discovered the dry land, by restrayning all the waters into one place: fo it was most necessary, that he should inwardly water the earth; by which stones, mettalls, minerals, & other fuch things in the bowells of the Earth, should in time grow and increase. Also that fome water should from hence breake vp out of the Earth, for diverse causes heareafter spee fied. Finally as Philo-Indens affirme; for the continuat on of the parts of the earth, which otherwise might by drouth be separated and divided. The third proposition grounded on the two former is this; That many rivers and fountaines in divers places by God's decree arise out of the earth, by grantities of waters hid in the cavernes of the earth, which they proue by reasons drawne from the vtility of such tountaines and rivers, springing out of the earth. Fourthly they defend, that all fountains and currents were not fo made and appointed in the first Creation: because Histories & experience teach v., that many haue broken out of the ground afterwards; whereof we shall have occasion to speake heereaster. Fifely they

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they affirme, that if the opinion of Aristotle be understood of all fountaines and flouds, it cannot be approved; for afmuch as it feemes sufficiently declared in the third opinion, Low fuch rivers might be generated without fuch vapours; as also because many arguments and places of holy Scripture, feeme to proue the contrary. As also the foure Rivers of Paradice created in the beginning of the world, cannot be gueffed to draw their originall from such vapours, as Araftothe imagines; to which accord many ancient Fathers upon these places recited in that opinion, whereas all rivers are thought to fetch their original from the sea. Sixtly for the credit of their mafter Aristotle, they are constrained to averre that although his opinion cannot be verified of all rivers and fountaines of the earth, yet if it be restrayned to some such perpetual currents, it may have probability. For almuch as we are to believe that many fuch large caverns and holes are hid vnder the earth, in which no small quantity of vapours may beingendred. This probability is greater in those rivers which are leffer in quantity then the greater, for the reasons before Thewed. Seventhly they affirme that it is absolutely to believed; that not only great rivers and currents are derived from Subterranean waters, which have original from the sea; but also leffe fountaines and springs for the most part, challonge the same beginning: whence they labour to proue by th s reason, that in very few places of the earth there is found fo perpetualland apt disposition of vapours vader the ground as to nounth fo many and to great currents of water. Eightly (fay they) it canno be denied, but that Waters as well proceeding from raine, as that which is generated of vapours in the cave ins of the earth, fometimes may flow into fountaines and rivers: What concernes Torrents bredd of raine, they haur ecourle to the reasons of the first opinion; for others they make it alto probable; because we see by experience that Vapours and Hire compassed about with earth, are by reafon of the cold environing it, turned into water. This is indeed the opinion of those subtil lesnits of Conimbra, wherein although they give a flourish, as if they would detend their mafter

mafter Aristotle, on whom they comment; yet meane they nothing leffe; but indeed warily flicke to the other of the Divines and ancient Fathers of the Church, touching the derivation of all torrents from the fea: Which opimon, how foever in it felfe most probable, they know not how to manage and defend against opposition. For whereas they suppose that in the first separation of the fea from the dry-land, a great quantity of water was dispersed into diverse hollow places & caverns of the earth, from whence Rivers are deri ed and made; they have not in any probable manner expressed, how this water should perpetually flow, and feed so many & great currents: For first, I would aske of these learned fathers. whether the water inclosed in the bowells of the earth, whence these springs are fed, be higher or lower then the fountaines arising out of them. If it be higher; whither the Rivers are continually nourished on the old store, or a new fupply be daily made. That fo great rivers should be maintained so many thousand yeares out of the old provision, is most improbable; because the mountaines out of which such springs arise, cannot be capable of so great a concavity: neither can it otherwise be imagined, but that many great rivers fince the beginning, had either bin absolutely dried up, or at least diminished in their quantity, their Cifternes being daily more and more emptied out into their channells. If they graunt that of this water, a fresh supply be made; it must be either from the fea or from vapours in the earth. It cannot be from the fea: because (as we have proved before) the fea is lower then the fountaines, where springs breake our of the Earth; for asmuch as we see them runne to the sea from their fountaines, as from a higher to a lower place. That this supply of water in the depth of the earth should be made by vapours, it is also improbable in their opinion; who cannot is magine so many ingendred in one place, as to feed so great currents; as also because many rivers were apparant in the first creation, as the foure great currents of Paradice, This objection hath to farre driven the Tefuits to their shifts, as that they have bin enforced to have recourse to the opinion of Thomas Aquinas,

Aquina, who dreames that the waters are enforced vpwards. by the influence of the heavens, which they a litle before cast by, and we have before sufficiently refuted. And whereas in the subsequent clause, they labour to salue this place of Ecclesiastes: That all Rivers come from the sea and returne this ther againe; They are conftrained to leave their old grounds. and runne backe to Ariffotle, who holds that all rivers had their original from vapours, drawne up by the funne: whereof the fen is the chiefe mother. It wilbe expected at least that we should disclose our owne opinion, having centured the former: which we will briefely doe as neere as probability can le dys, sub-mitting all to these which are more indicious: First therefore, we will suppose as probable: that the earth is in a manner compassed round about with water; for howsever the places more eminent, and separated for our habitatio be dry land yet not farre vader the superficies of the earth. whereon we trend, is the earth sprinckled round with water, for which we may draw an argument; as well fro the Porons and spongy nature of the Earth, which is apt to drinke in the water of the sea, in the same hight; because it is the nature of the water, to diffuse it selfe abroad) as also from experience of Miners and fuch as digg deepe into the earth, who in most parts find water. 21, this water so environing the earth. were it left to it's own naturall fituation, without an externall Agent, would lift his superficies no higher, then the superficies of the fea; because being as one with the fea, it will challenge the fame Spharicall Superficies. Now to know how the water thus naturally fettled, is notwithflanding lifted vo higher to become the fource of Springs, we must vaderftand, that it comes to paffe not onely by the heat of the funne and flarres, piercing farre under the superficies of the earth, according to the circle, we have allotted to the water. But also to subterranean fires hid in the bowells of the earth. in many places: which are caused by sulphurous matter set on fire by the funne, or fome other accident: whether this fulphurous matter be pure Brimstone, or Bitumen, or a mine of seascale, as some have thought of our Bather in England, I will

will not curiously here dispute, being of it self too large a subiect for me in this place to handle. This hear may be conceived to concur to the production of fountaines 2 manner of waies; First, by drawing vp diverse moist vapours, which by reason of the thicknesse and folidity of the earth, being not presently evaporated out of the superficies of the earth, are entorced to disperse themselves through divers crooked passages, where condensated by cold distilling againe into drops of water, they breake out through some place of the earth, and so become a fountaine. A fecond way which may also feeme probable, is that the Heat pearcing the Subterranean Water, though not . able to diffolie much of it into vapours for the folidity of the earth, may notwithflanding through his heat, Rarifie and attenuate thefe waters. Thefe waters then ratified, muft needs feeke a greater place, wherin they may be contained: fith Rarefaction is nothing else but the extension of a body to a greater place then before it occupied. Hence is the Water enforced to enlarge his limitts: This enlargement or the place cannot be downeward towards the Center; because all that place was supposed to be filled vp as farre as the barth could drinke it. Wherefore it must needs extend it's limits sidemise or upwards: By the former of which it may find a passage to breake forth on the superficies of the ground: By the later it may be lifted high enough, to runne from the fide of a higher mountaine, towards the Sea-shore. If any man should aske why this Rarefaction & swelling of the Water is not so sensible in the open Ocean: I answere that the sea is also much rarified and lifted vp by reason of the sunnes heat: which whether it be the cause of ebbing and flowing of the sea, in part we have before disputed. Second'y that the fea-water should not rife to high as other Water under the ground, thefe reaions may be given; First that the Ocean hath a larger channell to runne abroad on either fide, and fo this swelling must of necessity become more insensible, whereas the Waters in caverns & concavities of the Earth, being oftentimes straightly bounded on either fide, by the narrownesse of the channell, must of necessity take vp the more in hight & eminency. 2

the Sunne, heavenly bodies and Subterranean fires worke more Brongly and effectually on the open nakednes of the fea, then on the waters hid vnder the ground, which are more shrowded from such an extreame heat. Whence it comes to paffe. that many parts of the fea, are diffolued into vapours, and fo confumed and dispelled by the same; Whereas this heat in the Subterranean waters being more moderatly impressed; docth not diffolue into vapours, and confume fo great a quantity of of water,; but being of a middle temper, rather ratifies it to the vse forenamed. This seemes the more probable, because fpring water rifing commonly in the fides of mountaines, is for the most part thinner then the Sea-water, as experience dayly warrants. Thirdly, the subterranean vapours are sooner diffolued into dropps of water by reason of the cold they must necessarily mecte within their passage, through the Earth; whereas the other from the Sea meet with no fuch encounter till they arrive at the Middle-Region of the Aire. whence they returne againe in showres of Raine.

2 All Rivers and Fountaines were not from the beginning.

For the confirmation of this affertion, many histories may be produced: It is reported that in Caria neere about the city Lorse, there arose out of the Earth suddenly a great floud of Water, bringing our with it a great quantity of creatures and fishes, of which being fatted under the Earth, who socuer chanced to eat, dyed prefently. The like is reported, that at the time of the Mythridatick warre, at a certain city of Phrygia named Apames, there sprang vp out of the ground many new Lakes, Fountaines, and Brookes; and that one river fprang vp very falt, which brought vp with it a great quantity of Oisters, and other Sea-fishes; although the City Apamea be very farre off from the Sea. This is reported by Nicolam Damascene. Also Cardinall Contarenus testifies in the second booke of Elements, that in a cleare day being in Valentia in Spaine, there happened a very great Inundation of water breaking out of the Earth, which being carried towards the City,

3 Many Rivers are for a great space of land swallowed up of the Earth: whereof some after a certaine distance rise againe.

This is confirmed by many historicall instances, as of the river Timanus in the province of Aquilia, of Erasenus in Argolica, Padus in the Aspes; more remarkeable is that of the river Guadiana in Spaine, which runneth under the ground, for the space of 13 leagues, and reere to a towne called Villa Horra breakes up againe; the like is recorder of Enrotas in Arcadia, which is taid to breake forth of the ground in the province of Lacedamon: So Cadma in Asia is swallowed up in a hole of the ground, not sarre from Laodicea: so Pyramus in Cataemia, Licus in Libanon, Orontes in Syria. Other rivers are thought to have found a secret passage under the sea from one Region to

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another: As a river having his fountaine in the mountaine Meiates, which being convayed in a blind Channell under the middle of the fea, comes forth agains at the port of Panormus: fo others report of Alphius, which being drowned vnder ground nere the Peloponnefian shore, takes a large iorney under the Sea, till it ariue at Syracufe, where it ends in Arethuse; which brings forth (they fay) fuch things as are cast into Alphens: which is much like that which is spoken of the Well of Esculapins in Athens, wherein if any thing were cast, they were rendred againe in Phalericus: But this last I rather hold as a poerical fiction, then a true History . Some rivers there are which are not wholly drowned in the earth; but for fome part; as a part of the Rhene, which is hid about foure thousand paces from the city Canba, and shewes it selfe againe before it come to Bonna: in like manner a part of Danubins which hides it selfe about Greina a Towne of Panonia Superior: Some rivers there are againe, which are not drunke vp immediatly of the earth, but of certaine great Lakes into which they fall; as Iordan of the Lake Alphalittes: some lakes againe hauing swallowed vp rivers (as it were) vomit them forth againe: as Rubrefins casts out Arace in the Prounce of Narbon; and fo Lemannus the river Rhodanus in the fame Province: alfoin Italy, Lorus casts out Abdua; Eupilus, Lambre; Fucinus , Marria.

4 Rivers for the most part rise out of grent Mountaines, and at last by diverse or one In.

let, are disburthened into the sea.

The first part of this propositio is manifelt enough out of divers instances of the greatest rivers in the world: for all Goographer's wili give you to understand, that the river Indus in India is derived from the mountaine Cancasus. Tanais from the Rephean mountaines in Sarmatea, Araxis from Panardes in Armenia, Po from the Vesuvian Hills in Liguria, Danubius from Arnebia in Germany, Exesus in Norice from the mountaines Elacha Isara from the ridge of the Alpes toward France and Durian toward Isaly from thence. So from the Herminian

mountaines in Portugall are derived three great Rivers: So Nalus in Africh from the mountaines of the Moone: Thefe riuers thus rifing, are of diverse, kinds; for some have visible apparant fprings and fountaines; others are derived from Lakes, out of which they runne. As Alba in Prusia, out of Elbinga, Medoarus & Oxus cut of two lakes of the fame names, neere the Alpes: Rindacus from Artinia a poole besides Melstopolis. The reason why rivers should be ingendred in mounraines, and fuch high places, may be given; because they are made (as we shewed before) by the heat of the funne, flarres and subterranean fires, ratifying and attenuating the Waters. And this operation of the funne in higher places, must needs be more effectuall then in lower. Now for the second part, it is plaine to proue, that all rivers run into the fea: either making a passage from their fountaines, on the land toward the fea shore, as Nilm & Danubius, with other rivers, or by difburthening themselvers into greater Rivers, wherein they are convaied into the fea:as the 60 great Navigable rivers, which emptie themselves into Danubius, or at least are swallowed vp of the Earth, and so reduced againe to their first mother: which we may imagin of the rivers fore poken of, drunk vp of the Earth: Although all rivers (as we shewed) fall into the sea. yet not all in one & the felffame fashion; if we respect their pasfage on the land. For some are caried into the fea by one offinm or mouth, whereof we have two norable examples; the first of a great river in Brasilicalled Rio de La Plate, which is caried into the fea, by a mouth of 40 leagues, with fuch violence. that the Mariners may thence draw fresh water before they come within fight of land. The other not much vnlike, is that which runnes by the kingdome of Congo & Angolo, which is fix and thirty thousand paces broad, where it enters into the fea, and is carried with fuch a force, that it fevers the wayes, & keeps his owne channell, and renders'the shipp-men fresh water betwixt the fea waters, for the distance of eight hundred thousand paces. Other great rivers are disburthened into the fea, by diners oftia or Inletts; as Rhene into the Germane Ocean by three; Danubius into the Ponticke fea, by 6; Indus into the

the Indian sea by 7; Nilus into the Alediterranean by 7 great and famous passages: Volga into the Caspian lake by 72 gates. These are the most remarkable: others we shall supply in our historical part.

5 Diverse fountaines are endowed with diverse admirable vertues and operations.

There is nothing wherein Nature delighteth more in mi. raculous variety, then in fountaines and springs of the earth. Of these admirable workes of nature, being infinite in these springs, I will touch some. Which the better to effect, I will reduce all to these heads: I Their qualities and operations. 3 their Motios: For the former we will produce some sew instaces. It is reported, that neere the Garamantes there is a fountaine fo cold in the dayes that no man can drinke thereof : fo bot in the nightes, that no man can abide to touch it: There is another in India wherein a candle will burne. There is also another called heeretofore the well of Iupiter Hammon which in the morning is luke-warme: at noone cold, in the energing Hot, at midn ght boiling hot; From whence gaine it begins to affivage till the morning; and fo (as it were) by turne it growes hort and cold; a matter of great admiration. Some fountaines in Ligaria & Paphlagonia being drunke will make the head giddy as if he had drunke wine: Another fountaine in Aranea a part of Arcadia being drunke, will so affect the tait, that who drinks it shall never afterward endure the tast of wine: which was very like the fountaine Chrorius wherof Guid in his Metamorphofis the last booke fings in this man-Clitorio quicung, sitim de fonte levarit,

Vina fugit, gandet g, meris abstemins vadis.

The ancients have also recorded, that in Bastia neere the river Orchomenon, are two fountaines; whereof the one gets memory, the other causeth oblivion. There is in the Hand Con a fountaine making the tenses dull; another in Athopia, whereo the Water drunken will make a man madd: Some water absolutely kils him which drinkes, as the river Strain Arcada, being a venemous fretting poison, and therefore

by the poets fained to be one of the rivers in Hell. Divers other rivers are profitable to cure divers difeates of the body. whereof I need not bring any instances; because such newfound wells are fometimes discovered amongst vs here at home. There are a rivers in Beestis of admirable vertue. whereof the former, if a fheep drinke of it, he will become yellow: but if a fleep of a dunne or yellow colour drinke of the other, he will become white: Rivers which make sheep white coloured besides, ore Neleus in Enban, Aliacmon in Macedovia: (rathris in Thurys: fo Cerens in Enban, Auxins in Macodonis, Poneas in Theffaly, will make them blacke: Clyenmans will cause whitenesse in exen: So the river Affaces in Pontus waters the land, wherby mares have their milke blacke. Amongfithe regions of the Troglodites, there is a well which thrice a day will become freet and bitter, and againe returne to his former sweetnesse, and so often againe in the might. This may suffice to shew the variety of operations in these wells, in respect of other creatures. No lesse admirable variety is discouered in observing of their diverse motions. For some riuers ouerflow their bankes at some certaine times of the yeare, as Nilus in Egypt, Euphrates in Melopotamia, Indus 12 India: fome fountaines are carried with fuch violence, that they cast up stones, as Marsia in Phrygia, and expell any weight as a certaine one in Arabia, whereof the like was recorded to be in Portugall: fome will fwallow up any thing throwne into them, as one in Portugall, if we believe Plany: fome others although they are cold, will feeth and feeme to boile as the water on the fire; yet neuet cast out their water beyond their bankes, but ftraigh-way swallow it vp againe, as Acidula in Albegano, and another fountaine in Cappadocia named Trana; some there are which sometimes rise and swell, and other times fall againe of their owne accord, as Crater of Turinge, and a fountaine in Italy called Pluviana: fome wells imitate the ebbing and flowing of the fea in all enereafes and diminutions, as one in Cales, and the other neare Burdeaux in France: some are contrariwise affected to the ebbing & flowing of the fea, flowing when the fea ebbs, and ebbing when the fea

fea flowes as certaine Pres in Spaine: some encrease and diminish without any consent or agreement with the motion of the sea; as a Wellin Tenedas, an Iland year Troy. In Cantabria are three sountaines, distant 8 foot the one from the other, and falling into one Channell in a vaste river, which every day are dry twelve times, and sometimes twenty times; others of their own accord purge & cleanse themselves, casting out wood; clay, durt, & other matters wherewith they are defiled, as a Well in the Chersonesus of Rhodes. These and many more remarkeable instances have our naturall Historians gathered together, whereof though some perhaps may be thought to be forged of Poets for pleasure, or mistaken for want of good discovery and observation; yet must we not wrong Antiquity so much as to reject all, having in this subject enough to wonder at in our own Country.

6 Places neare great Rivers and Lakes are most commodious for habitation.

It hath bin the custome of all times and nations almost in the world, to choose out for a choice place for building of cities their habitation neare some great Lake, River, or Arme of the Sea; which sprang from the common observation of Men. who found such places to be more convenient. This conveniency is shewed many wayes: first, because by meanes of fuch water they have quick passage and trafficke with other Nations, being able with more ease both to receive, & co fend forth wares and marchandice. Whence we fee that fu. heities as are seare! vpon the water, are commonly of all other the richest: whereof we may give an instance almost in enery countrey, as of Senill and Lifbone in Spaine & Portugall: of all the Cities almost of the Low-countries; of Paris in France: whence (no doubt) grew that English Prouerbe; That the Sea is a good neighbour ; which may aswell be understood of any navigable River. Secondly, such a fite is most convenient for the purging away of all fith and excrements, which could not with the like conveniency be so soone transported by land: whence many men haue laboured to transport rivers far remote

remote vnto Cities. Thirdly, because such rivers and watry lakes yeeld store of sish, whereby the Inhabitants may be nourished, and other creatures the better preserved: Fourthly, no small commodity would accrew to a City by water neare adjoyning. If it should chance (as often it doth) to be set on sire; for having water neare it, it may soone be quenched: whereas many little springs cannot afford so much water as would suffice for such a purpose. Lastly, amongst other reasons we cannot forget the pleasantnes of saire rivers, which are no small ornaments to a City, and delights to the eye of the Inhabitants.

8 Thus much for rivers: A Lake is a collection of perpetuall Waters, nourished with fresh springs, and having of it selle no pas-

fage forth.

In this definition of a Lake, we have comprized thefe three things: First that it is a collection of constant and perpetuall waters: Secondly, that it is continually fed & cherished with fresh springs, rising vp from the bottome. Thirdly, that it finds no passage forth into the sea or otherwise-By the two first it is distinguished from a great Pond or standing poole called in Latin Stagmum: For asmuch as a flanding poole, being commonly fed with raine water, and having no fprings from the Earth whereby it may be long nouished, is oftentimes by the heat of the funne exhaufting it out by vapours, either extraordinarily diminished, or altogether dried vp. Whereas in a Lake by reason of fresh springs, the Water is perpetuall and remaineth sweet and holsome, except by some other accidents, it change it's disposition. For the latter clause that a lake finds no passage forth, it may be two waies understood: either of a visible or apparant passage outwardly through the superficies of the Farth to the sea, or of a faret and fubterranean paffage vnder ground: The former may againe be underflood of a paffage forth immediatly by it feit, or mediatly by some river : whereas wee have said that it finds

finds no entrance into the sea, we ought to vnderstandit, that immediatly it is not to be accompted a continuate part conjoyed with the sea; neutrithelesse it may be disburthened into the sea by some rivers running out of it, as some would have the great river Tanais not to have his head or sountaine in the Rephasis mountains, as the ancients have taught, but in a certaine Lake not farre from the city Tullatso Volga & Edill draw their originall from a lake not farre from Moscow; with many others of like nature. What to thinke of the subterranean intercourse betwirt Lakes and the sea, we will shew in this Thoreme.

I It is probable, that most Lakes have some secret intercourse with the sea under ground.

For the confirmation of this point, there want not reasons: The first reason may be drawne from the quantity of Water in most Lakes, which is found without any great tensible difference to remaine the fame, without any dimiuntion or encrease; whereas if the water bound in with these limits, should have no passage out any way, it should encrease to such greatnes, that it would eafily over-whelme the bankes. To give a few instances, we find that diverse very vast rivers exhauft themselves into the Caspian Lake as Volga & Edill. which receiving into them many notable rivers, are at last themselves swallowed up in the said lake: In like manner the Lake of Palestine called the dead sea, is known to receive into it besides diverse lesser rivers, the great and famous river Iordan. Heere would I demaund, whether these great rivers perpetually casting themselves into a Lake, give an encrease to the former quantity or not: if they should augment the water, they would by confequence alter the bounds: But this is contradicted by experience. If the quantity of the water fuffers no encreale, it must needs follow then, that the water should some other way be diminished, as it is heere encreafed. This must either be by the funne drawing vp fome parts of it by vapours, or by some caverns of the Earth, drinking vp some parts of it: Or lastly by a subterranean passage into

the fea: Concerning the former it cannot be denied, but much Water is drawne vp into vapours by the heat of the fun, yet that these vapours countervaile the water perpetually brought in, is in my conceit very improbable: for against this quantity of water extracted out this way of evaporation, I will oppose these three things which shall perswade a reasonable man, that the water received in, shall farre surpasse the vapours exhaled from it: First that the vapours are stirred vp in the day time, when the funne is lifted about the Horizon; at fuch a height that his heat is somewhat strengthned, wheras all thefe watry currents never intermitting their vivall course, neuer cease to runne by day or night: wherein is seene a double aduantage of the rivers, in respect of the watry exhalation: Secondly of these watry vapours, so drawne out, a great part must at diverse times returne back, or at least so much otherwise by rayny showres, dropped downe into this Lake. Thirdly, these watry parts thus rarified & attenuated in vapour should (putting this supposition) in aquality, diffuse themselves abroad in such extraordinary manner, that all the Regions round about should in all likely-hood suffer a great inconveniency of foggy exhalations. On the other fide it is very vnlikely, that it should bee received into empty caverns of the Earth, without passage into the sea, or some great river difburthening it selfe therevnto. For I would demaund whether these cavernes were ever filled with water or not? if they have bin filled, how could they receive more water, fith the filling of any place supposeth it to be first empty. That they were never yet filled with Water, is farre more vnreasonable: that any man should imagine, any cawerne of the Earth to be fo valt, which fo great cur rents of Water perpetually running in almost fix thousand yeares, fhould not replenish : especially considering the bow-"ells of the Earth, not farre from the vpper face, to be every where spread with Water round, which might also helpe to this purpose: Wherefore it cannot well be imagined but that every such great lake, bath some vent or passage vnto the fea, either by some fecret & subterranean channell, or

at least by some great river issuing out of it, and so running into the Ocean. Another reason may be taken from the currents of some seas, which are by good reason ascribed to this cause: For it is observed by skilfull Naugatours, that the Water is carried by a very stiffe course from Propontis and the black fea into the Agaan, and from thence into the Mediterranean: The originall of which current may with good conjecture be found out in the Caspian, which by some secret paffage vnder ground, difburthening it felle into the black fea. cauteth it to enforce his owne waters farther of, for the receite of the other. Thirdly that these subterranean passages are not vnlikely, may be confirmed by many rivers which are Iwallowed vp, some wholy, some for some place only of the Earth, whereof we have spoken before. Also it may seeme likely by the Water, spread round about the Earth, which through the bowells of it finds a passage from the sea, bearing as it scemes the same levell. This may (for ought we know) be the original of all Lakes, and this also may be a way or mean's, whereby they empty and difburthen themselues, being overcharged with too much Water.

CHAP. X.

Of Mountaines, Valleyes, Plaine Regions, Woods, and Champian Countryes.

He second variation in the figurature of the Earth is expressed in Mountaines, Valleyes, and Plaine Countreyes. A Mountaine is a quantity of Earth heaped about the ordinary height X3 of

of the Land. A Valley is the depth of the Earth between two Mountaines. A Plaine is a space of Earth where there is found no notable rising or falling of the ground.

The distinction of the Earth according to it's externall figurature into Mountaines, Valleyes, and Plaines is very naturall; because every space or parcell of land in respect of the places neere or about it, must either rise higher, or fall lower, or at least must beare an æquality; where the former is admitted, there must needes be Mountaines swelling higher then the ordnary levell of the Earth; where the second is found, the ground is indented with Valleyes and concavities: where the third is to be feene, there must be Plaines. Here is to be noted that howfocuer Flames absolutely considered, have a sphæricall surface for the most part, especially if the Plaines be large, because they concurre as circular segments to make vp the Spheare of the Earth; yet they may be called Plaines, because they so appeare to our sense, which in so short a distance, cannot perceive the Spharicall figurature of the Earth; Some Grammarians here curiously distinguish between mons or a Mountaine, and Collis or a Hillock, which is a litle hill: & also betwixt Vallis, which they would have to be a low parcell of ground betwixt two mountaines, and Convailis which is a lower space, only bounded on one part by a mountaire, which Varro would have to be defined from Cavata valles; but these Grammatical scruples are of small vse to such as spend themselves on greater matters: because the ordinary & viual manner of speech (euen amongst the vulgar) will shur out all mistakes in this kind; what descrues the study of a Topographer conce ning this , shall be expressed in these Theoremes.

Mountaines, Valleyes, and Plaines were created in the Earth from the beginning, and few made by the violence of the Deluge.

It hath bin the opinion of some, aswell Dinines as Philosophers, that the violence of the Deluge hath extraordinarily altered & defaced the Earth, being the chiefe cause of Mountaines & Valleyes therein: but this opinion is contradicted by many reasons; first out of the Text it felfe of Genesis, where it is faid, that the water of the flood ouer-flowed by 15 Cubits the higeff Mountaines: to which may be added the Tellimony of Damascenus, who reports, that in the time of the Deluge, many resorted to a high mountaine of Armenia, called Baris, where they faued thefelues which last clause although it expresly contradict the holy Scriptures, which speake but of Eight Persons that were saued: yet it is a sufficient testimony to proue that such Mountaines were before the Flood, & therefore not made by it : Secondly had there followed fo great an alteration of the Earth, to cause monutaines as some imagine, then should not the same places after the flood retain their names, bounds, and descriptions, which they did before the flood; the contrary whereof we find, in that Mofes writing of Paradice, & other places, about 850 yeares after the flood, was most exact in fetting down the Names, Limits, & whole description of them, as though they had remained to be seene in his dayes. Thirdly, had the violence of the waters beene fo great as to raife vp mountaines in the Earth, it would without doubt have bin forceable enough to have turned Riners, and have changed them from one place to another, cast downe & demolished the greatest Cities and buildings, throwne downe and ouer-whelmed all plants and vegetalls on the Earth, and (as it were) have buried from all succeeding time, the memories of the former ages, fo that little or nothing should appeare: but this may bee proued otherwife by fundry Inftances : First that the the Rivers haue still remained the same, may appeare out of the place alleaged of Genefis, where Moses speaking of the fite of Paradice, fet downeall the rivers of texactly, especially Tyoris & Euphrates: out of the which we may eafily gather in what langitude & latitude it flood; had any thing bin altered in the course of the rivers, it is likely Moses would have specified

fied it in this Historie, that after ages looking for these places. might not miltake or suspect the truth of his Relation: Secondly, that it hath not exinguished all Buildings, and ancient monuments of the fathers before the flood, may probably be conjectured by the testimony of lofephm a writer of good credit, who affirmeth that he faw one of the pillars, erected by Seth, the second from Adam; which pillars were set up aboue 1426 yeares before the flood, accompting Soth to be a hundred yeares old at the erection of them, and losephus himselfe to have hued some 40 or 50 yeares after Christ; Now although we are not bound to credit all that he relates; yet may we trust him concerning such matters as happened in his time; and that this pillar was fet vp by Seth was neuer yet called in question, but warranted by antiquity; the like is recorded by Berofus of the Citty of Enoch, that it was not demolished by the flood, but remained many yeares after, the ruines whereof as Annius in his commentary reports, were to be seene in his time, who lived in the time of Ferdinand and Isabella of Caffile. It is also reported by Pomponius Mela. that the Citty of Joppa was built before the flood, of which Cepha was King, whose name with his brother Thineus together with the grounds and principles of their religion, were found grauen vpon Altars of stone: All which are sufficient to proue the violence of the Waters, not to have bin fo great to demolish all mountaines & monuments; Moreouer it may be plainly proued out of the text, that the Waters suffered the plants and trees of the Earth to grow, and remaine as they did before; because it is said, that when Noah the second time fent out the Done, the returned with an oline branch in her mouth, which no doubt she had plucked from the trees, after the trees were vncovered; for otherwise she might the first time have found it floating on the Waters: a manifest proof that the trees were not tome vp by the roots, or turned toply turvy but remained Earth as they did before. Boutthly treame violent motion, as whence th be from the natural

naturall motion of the water, which is to moue downward: for what descent of waters can bein a Sphericall or round bo. dy, where no part is higher, or lower? That there was any wind to drive and enrage the Waters, is very vnlikely; because it is said, that God caused a wind to passe vpon the Earth, and the Waters ceased; so that there was no wind till the Waters fanke: Laftly, we may argue from a finall cause, that this inaquality in the superficies of the Earth was before, the flood; because it is certaine that all things were in as good or better estate, then now with vs, and that the Earth was adorned with all varieties of creatures as well for profit as delectation. Now it is found by experience, that all commodities agree not to all places, but some are found in the mountaine, as all forts of mettalls & mineralls, Plants, & Vegetalls for the most part prosper best in the vallier and plaines: Alfo that the mountaines ferue for a shelter to guard the vallies from the rigor of celd and wind, both for the better councilencie of mans life, and encrease of fruits for the vse of man: Whence we may conclude, that it is farre more probable, that the great Mountaines were so created in the beginning, and not made by the flood; yet can we not deny, but that some small Hillockes might be made by the flood, and afterward by the industrie of man, which have raised great fortresses, & bulworks, which afterward decaied, were made great heapes of Earth(as we fee many in this land) but this is of small note & net worthy confideration, incomparison of the great mountaines of the Earth whereof we especially treat.

2 The perpendicular height of the highest mountaines seldome exceeds 10 surlongs.

This proposition depends on the authority of Eratesthenes a samous Mathematician, who being emploied by his King, found out by Dioptrick Instruments the height of the highest mountaines, not to exceed the quantity about specified. Cleomedes extends this a litle farther, and would have some mountaines to attain the height of 15 surlongs, of which height he would have an high rock in Bactriana called by

Goond Booke.

Strate 11 pet if we credit Pliny on rain Pelion accopted the Dicercha ountaines of The faly, to be highest he fo furlangs: and Solar higher then elfe-where and be found - But this opinion how focuer supported by the authority of the ancient and famous Mathematicians , hath bin called in quastion as well by moderne, as ancient writers. Many matters are miraculoufly, or rather fabuloufly fpoken of the Mountaine Athos in Macedonia, of Cassins in Syria, and another of the same name in Arabia, of the mountaine Cantalia, and others; which Histories notwithstanding are related by no meaner Authors then Aristotle, Mela, Pliny, and Solinm, yet it is not hard to imagine, that these Authors might be deceived in those times, either truffing to other mens relations, or wanting Mathematicall instruments, to search these matters: Of the Mountaine Athos it is much wondred at , that it should cast a shadow from Macedonia into the market-place of Myrbina a towne of the Hant Lemnos, diffant from Athos 86 miles: But this as our learned Countriman Mr Hues well obserues, can be no great argument of such a miraculous height; because the mountaine Ather fituar East from Lemnos (as may be gathered from Ptolimies Tables) may without any great wonder oast a very long shadow, the Sunne ether rifing, or fetting. Other matters are related of this mountaine Athor more strange then the former, to wir, that it should in hight transcend the Region of the raine, and wind, which they would frive to confirme out of an old tradition; that the after heaped together on certaine Altars built on the top thereof were neuer blowne away, but remained in the same manner as they were left: to which may be added out of Strabe, that they who inhabit the top of this mountaine, can see the Sunne 3 houres before those who inhabit recre the fee: The I ke is reported by Ariffotle of the Mountaine Cancalus, that for the extreame height, the top of it enjoyes the Sun-beames a third part of the night; Litle leffe is spoken by Flury and Solinus of the mountaine Cassius in Sy-

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ria, and by Pomponius Mela of the mountaine Cassins in Arabia; But how fabulous and incredulous these things are. Petrus Nonius and other Mathematicians have fufficiently demonstrated out of the grounds of Geometry; more absurd by farre scemes that, which Enflathins reports of Hercules pillars celebrated by Dionysius Perieges, for their admirable height; whereas they are found not to exceed 100 ells making one furlong; a height according to Strabe not exceeding the Egyptian Pyramides, and comming short of certaine Indian trees neare the River Hyarotes, whose Meridian shadowes reach & furlongs; These errours in the ancient might seeme veniall, had they not bin seconded by latter writers: Of the Mountain Tenariffe in the Canaries, Scaliger is bold to report out of other mens relations, that it rifeth in height about 1; leagues, which make 60 miles; but Patritius more bold then he, would have it 70 miles; Litle leffe is spoken of Pico amongst the Azoris Infula, and the Mountaine Ands in Peru; But to confute these relations we will vie this argument; It is reported by the Spanish writers which have spoken of this place, that the topps of these Mountaines scarce any one or two monethes in the yeare are free from from: Now that (now should be ingendred about 60 or 70 miles about the ordinary plaine of the Water or Earth, is against the judgment of our best Astronomers; because, as they have observed out of Eratofthenes measure, the heighest vapors seldome reach so farre, as 48 miles inheight every way from the Earth. This argument may as well ferue to confute thefe ancient opinions before mentioned, had they not bin so fabulous, as scarce to deserue any solide confutation.

the Scain diverse places is more then the bight of the highest Mountaines above the ordinary face of the Earth.

We have probably shewed out of former grounds, that as the ordinary height of the Earth is answerable to the ordinary

nary depth of the Sea, so the hilles and mountaines in proportion answere to the whirle-pooles and extraordinary guiphes of the Sea: but it is to be imagined that the depth of the Sea in the maine Ocean, is farre more below the superficies of the Earth then those other whirle pooles and Holes extend themfelues below that depth. But to prove this by a more sensible Argument we will compare the one with the other, fo farre forth as Mathematicians by experience have gueffed; for it is found by Mathematick Instruments (as we have proved in the precedent Theoreme) that the highest Mountaines feldome or neuer mount voward about tenfurlongs, which is an English mile, and a quarter : but the hight of the Land in some places where appeare no fuch hills, is observed to be much more: to proue which affertion, we can have no fitter argument then the fresh Springs of Rivers; for it is manifest that all Rivers are higher at the Spring or fonntaine, then at the place where they disburthen themselves into the sea. Now although water is apt to flide away at any Inaquality, yet it is most probable that in greater rivers, especially where the waters fall oftentimes with violence (as at the Cataracts of Nily) much inequality must be granted in the Declivity of the ground: supposing yet the water for enery mile to gaine two foot in the Declivity of the ground, we shal find the hight very neere to aqualize the hight of the highest mountaines; although a foot in a mile is farre leffe then can be imagined in fo great a River: The River which I take for an example shall be Nilus, which we shall observe to runne about 50 Degrees from South to North , which resolved into miles will make 3000:accompting for enery mile 2 foot, we shall have 6000 foot, which will be neare these to furlongs, being a mile and parts; then allowing for these mighty Cataracts where the water falls with fo great a violence, we must recken a number offeet far greater then this measure; for every mile must the hight of land about the fea be much more then of the mountaines.

4 Mountainous Regions are commonly colder then

then other plaine Countries.

This Proposition is not absolutely to be understood without a limitation: for some plaine Countries near e the Articke Pole, may be colder then some billy Regions neare the Agnatour, in regard of other concurrent causes; but here we speake (as the Logicians vie) cereris paribus; comparing two places either together like, or not much different, or at least in our viide: flanding, abstracting them from the mixture of all other confiderations: that this Theoreme is worthy credite, diverse reasons stand in readines to intifie : the first may be drawne from the cause of heat in Inferiour Bodies, which is the reflexion of the Sunne beames. Now that this reflexion is of more strength and validity in plaine then in billy and mourtainous Countries, is evident: first, because (as the Optiches teach) therayes are more joyned and combined in a plaine, then in a convex superficies; for how soeuer the whole Earth be of it selfe Sphericall, yet the convexity being not sensible. by reason of the vastnes of the Circle, whereby the convexity is made leffe it may optically be called a plaine superficies: Secondly, it is taught in the Optickes, that a reflexion is of more validity in an equall, then in an vieuen & ragged superficies, fuch as is found in Mountaines and vneuen places. A fecond reason why mountainous Regions should exceed others in cold may be the vicinity of them to the middle Region of the Aire; for of all the Regions (if we believe Aristotle) the middle is the coldest, as being more separate from the Samme the fountaine of heat, and the higher Region, farther off from the reflexion of the Saune beames, then the lower: Now fith the parts of the Earth are affected with the quality of the Aire, it must needs stand with reason, that the more it shall approach to the middle Region the more it must partake of it's quality. Thirdly, that this is confonant to observation, reasons are vr ged by experience of all Travellers, who report the Tops of Mountaines even in the miast of Summer to be covered over with fnow, although fituate vinder or neare the Agninochiall Circle; Of this nature are the Alpes in Italy, the Mountaines

of the Moone in Africke, Andi in Pern, and Tenariffe in the Canaries. That (now should be an effect of cold, I need not labour to confirme. A fourth reason may be drawne from other effects of cold, or heat; for it is daily proued by experience. that fuch diferies as chiefly follow heat, especially the Peffilence in Egypt, and fuch plaine Countries, are wonderful przvalent, whereas helly and rockie Countries by the benefit of Nature stand in litle feare of such Inconveniences. Lastly,no greater argument can be drawne, then from the disposition of fuch men as inhabite fuch hilly Regions, who have all the Symptomes of externall cold, and internall heat : Infomuch as Bodin feemes to make a Harmony and Concent betwixt the Northerne man and the Mountanist ; the Southerne man & fuch as inhabite plaine countries, afcribing to the former externall cold, and internall beate: to the later externall heate, and internall cold. How farre this comparifon will hold, we shall have more, occasion to discusse hereaster, when we come to the confideration of the Inhabitants.

5 Mountaines since the beginning of the world baue still decreased in their quantity, and so will continually decrease vntill the end.

This observation Blancanns, Iknow not how truly, ascribes to his owne Invention: but to what Author soeuer we owe it, we must needs acknowledge a pleasant speculation, grounded on good reason. This Theoreme to demonstrate the better, we will first lay these grounds oftentimes before-meutioned. First (as appeares by testimony of holy Scripture) the figure of the Earth was in the beginning more perfectly Spharicall, ouer-whelmed enery-where with the Waters. 2 by That a separation was made by translocation of the parts of the Earth, in such manner as some places admitting of concavities, became the receptacle of the waters, other places whereon these parts of the Earth were heaped together, were made mountanous. 3 Hence will follow, that the Earth thus swelling vp in high mountaines, is out of his natural site and positions:

tion: & therfore according to the law of Nature, will endeauor by litle and litle to returne to her former state and condition. Now that the Earth hath fenfibly fuffered fuch a change fince the beginning, it is easie to shew out of experiments; the caufes we shall find to be the mater, as well of the Rain as Riners, which we shall demonstrate by these Reasons: I We see Riwers by litle and litle continually to free and eat out the feet of mountains, whence the parts thus fretted through, by cotinuall falling downe weare out the mountaines, and fill vp the lower places in the valleyes, making the one to encrease, as the other to decrease, & the whole Earth to approach nearer to a Spharical figure then before; which feemes to be warranted by a place in lob 14, where he faith to God; The mountaine falling. commeth to nought, of the rocke is removed out of hisplace. The waters weare the stones, thou washest away the things which grow out of the dust of the earth. From these Rivers in the valleyes continually eating through the parts of the Earth, at the feete of mountaines are caused those flow but great Ruines called Labina, a lambends, by which sometimes whole Townes and Villages have bin cast into the next great River. 2 To proue that Raine water challengeth a part in this diminution of mountains, we may shew by the like experience: we see plainly that Raine-water daily washes downe from the Toppes of mountaines some parts of the Earth; whence it comes to passe that the highest mountaines are harder and more rocky then others, as being more able to refift this violence of the water. Hence also it happens that old build ngs being erected in the fides of mountainer, have their foundations after a time vncouered, and are much subject to Ruines: an instance whereof may be given out of the Romane Capitoll, whose foundation (according to the relation of George Agricola) appeares now plainly about the ground, which without question was here. tofore deepe rooted in the Earth. In Plaines and vallyes we find all things to happen contrary wife, to wir, that ali places in regard of their superficies are raised much higher then they were in times past. The reason whereof may easily be given out of the great quantity of the Earth, carried by the wathing

of the Raine from the Tops of mountaines into the vallyes: whence we may perceive old houses, herecofore fairely built, to be now almost buried under ground, and their windowes heretofore fet at a reasonable hight, now growne euen with the pauement: so some write of the Triumphall Arch of Septimins at the foot of the Capitol Mountaine in Rome now almost covered with Earth, infomuch as they are inforced to afcend down into it by as many staires as formerly they were vled to ascend. In like fort we see in old Monasteries & Religious houses, their lower roomes, windowes, & doores, very far couched under groud, of which great incovenience we cannot fulpeet the Architects judgment, but rather our fore mentioned cause: from this burying of parts of some houses vnder ground, it may be gathered, that the farther they are under ground, fo much ancienter they are: as we may observe heere with vs in Oxford, that our most ancient Colledges have the windowes of their lower roomes, fomewhere altogether cheaked up with Earth without, or at least halfe way, in fomuch as the floore within, is found to be farre inferiour in height to the fireet without: This is also confirmed by Architects, who in digging vp old foundations, before they came to firme ground whereon to crect a building, are enforced first to remove away the Rubbish or (as they terme ir) the Made-ground, wherein oftentimes they find Wood, Iron-Instruments, oldcoine, with divers other Trash of this Nature. An instance we have in some of the lower places in Somerfet-Pire, where some vpon occasion digging the Earth somewhat deep, have found great Okes turned toply turvy with their Roots vpwards. To coniecture with fome, that this was caufed by Noah's Floud, feemes to be very improbable : I beemiess we have formerly shewed in this Chapter, the Water in the Deluge could not have fo violent a motion to procure such an alteration in the parts of the Earth. 2 It cannot fo well be imagined how fuch Trees Chould remaine fo long a time without putrefaction : wherefore we cannot well caft it on any other cause, then the addition of the earthly parts, brought by rame from the mountaines into the valleyes: and 10

so by some Land-flood which partakes much of slimy and earthly matter dispersed abroad vpon the land about. Now on the contrary part we find in few places of mountaines fuch made-ground which hath before bin moued. This will also appeare out of the industry of our Low-countrymen, who by baying up the Rivers into certaine Artificiall Channels, the ground about hath bin much raised : where on the contrary fide the forcing of the water into higher places, oftentimes is found to fret through the Earth, and make it lower. What we have spoken of the effects of Rivers and Raine in diminishing the greatnes of the mountaines and exalting of the vallyes, we may in some fort find in the sea. For the bottome of the Sea being lower then the Earth, & many great Rivers continually running from the Earth into it; it is manifest that there is carried in their current a great quantity of earth, infomuch as by the heaping of fand and earthy rubbish, the mouthes of great Rivers are in time choaked vp, and commodious havens spoyled & removed farther into the land: of which alternall transmutation of the Sea & Land we shall speake hereafter: & for present instance need to goe no farther then diverse Townes in Devon, which (according to the Relation of ancient men) have heretofore, bin faire havens, able to receive great ships, to which notwithstanding at this time a small boat cannot arrive except in a full Tide. The like whereof is reported by Ari- 1 Meter. fotle, t of a place in Egypt called Delta, made by the heaping vp of fand & flime, brought by Nilus from the Ethingian mountains. 2 of Ammania Regio, which in times past being Sea, through the flime convayed in the Rivers, became afterwards as a standing poole, which in processe of time waxed dry, and iouned it selfe to the Continent. 3 Of Maotis Palus, that the dry land environing it round, is fo much encreased, that ships of that burthen cannot arrive, which could in times past within 60 yeares before; which is also in some fort testified by Polybins. 4 The like is related of Bosphorus Thracius. and many other places recorded by Pliny, of which we shall speakehereaster. From these observations Blancanus would inferre these consectaries I That the Earth was not from the

Lib.s.

beginning endowed with mountaines: 2 That it should not so continue till the end of the world; and valesse the Fire (whereof the Scripture speakes) should prevent it, the who'e Earth should in the end be ouer-whelmed with waters, as in the beginning, and so be made void of habit tion; but on such consectures I dare not too boldly venture, being speculations built on no sufficient grounds: All which can hence warrantably be collected is expressed in our former Theoreme.

2 Of the Figurature of Countries in Mountaines, Vallyes, and Plaines, we have spoken: It is requisite here we speake somewhat of Woods and Champian Countries.

3 A Wood is a Region or space of Land beset with trees. A Champian Region is a space of Land either altogether voide, or scarce furnished with trees.

Some Criticks here curioufly diftinguish in Latine, betwixt Sylna, Lucus, & Nemus: by Sylva understanding a space befet with trees, ordained to be cut downe; but Lucus was a place where trees were not ordained to be cut downe, but referued facred: For in such groues they did anciently vie to offer facrifice, as may appeare by diverse places out of the Olde Teffament, where the Heathenish manner of worshipping was forbidden, and formetimes reproued in the Kings of Inda and Ifrael: That which the Latines call Newns, is a Grone or Wood ordained onely for pleasure and recreation: but the discussing of these businesses rather belong to a Grammarian then a Geographer; who takes litle notice but of thole matters which most principally and remarkeably belong to any Region; wherefore omitting other curiofities, we have distinguished orely betweene a woody and a champian Country; whereof (as we have defined) one is befet with a multirude of trees; the other with few or none. What concernes a Geographer

pher to observe in those matters, shall generally be comprised in this Theorem.

Woods in these dayes are not so frequent, nor so great as in ancient times.

We cannot imagine otherwise then that the Earth soone vpon the flood, bearing in her wombe the feeds of all vegetals, being inwardly moifined, and outwardly comforted with Heat, should presently abound with plants of all forts: infomuch as in a fhort time each thing propagating it felfe by communication of his own feeds, the whole Earth was ouergrowne as one forrest: but afterwards as man began to spread and multiply on the faceof the Earth, these Woods and Thickets began to suffer chastisement under the hand of laborious husbandry: For first to open a passage from one place vnto another, and that some parcels of ground should as pastures be divided from woody acres , it was necessary that this great plenty of trees should suffer a decrease: yet litle had this bin noted in fo vast a store, had not the invention of building of houses by litle & litle turned great forrests into Cities; which for the most part owed not only their first originall, but also their daily reparation to Trees and Timber: but aboue all the greatest deuourer of woods and forrests is fire, an element fed and nourished almost of no other matter. For to let passe the ordinary vie of fire in every house and family, which in so infinite a multitude of people, in fo many yeares fince the Flood, must require an extraordinary proportion of wood and fuell, how many Arts have bin fince invented, depending only vpon this Element? we will goe no farther then the Art of Liquefaction, fining of gold and other mettals, found out in the bowels of the Earth, wherein the couetousnes of men hath bin as vnsatiable as the fire. To this which we have fuid, may probably be opposed two things: first the power and inclination of every Creature to multiply and propagate it felfe. Secondly, the industry of mankind in seconding that inclination: Whence it may be conjectured that great woods should by durance increase to a greatet quantity: for the former, no man will

will deny, but that plants and trees left to themselues, will commonly propagate their kind: neuertheleffe it cannot prevaile so much as the other, which procure the decrease : first because the Earth being dryer now, then soone vpon the Flood cannot fo much further the growth of vegetals as then it did: Secondly, because (as we have said) this growth in a populous Country, cannot be so great as the diminution, fince few or no houses can want so necessary an Element as fire. To the second we answere that man's industry hath done fomewhat in plantation of groues, and fuch like: but how litle is this in comparison of the huge and vast forrests in time by man wasted and confumed. We shall read of Germany, that in the time of Cafar it feemed a wilde Country of having many great woods and forrells, but few Cities: but now the cafe being altered, we shall find the Cries both in number and greatnes increased, and the Woods diminished. Two instances may furfice, the one of the Forselt of Ardennain Luizenburg, accompted in Cafar's time 500 miles over, now scarce 50. The other of Sylva Hyrcinia, which heretofore (if we beleeue Histories) reached (o farre as a man could trauaile in 60 dayes; but now is made the onely limit or bound dividing Bohemia from the rest of Germany. The like may be observed almost of euery other Country reduced to civility.

2 Places moderatly situated towards the north or south Pole abound more in woods then neere the Æquatour.

This fituation we understand to comprehend almost all the temperat Zone, reaching either way so farre as 60 degrees or there about. The demonstration of this Theoreme depends of these two soments of all plants, Heat & Moissare; both which concurre, not only to the abundance and servility, but also to the greatness of all plants; for it is most certaine that wheresoener these two vitals succours are wanting or deficient, there must be a great scarcity of trees, fruits, herbage, & such like: This is the cause why the Regions farre North neere about

about the Pole, beyond 60 degrees, have not onely scarcity of trees, but have them fuch as are, of a farre smaller quantity then other Regions, lying more temperate: For the internall & naturall beat is almost extinguished, with the extremi. ty of cold, and the moisture (as it were) dried up by the frosty disposition of the Region. To this cause may we ascribe. that which Geographers have delivered concerning Island. that for want of Timber they couer their houses with fifb bones, digging out houses in the fides of Rockes and mounagines. Moreover that the meere defect of moisture may eause a scarcity of growth, may be proved by many places: I because temperate Regions, which are mountanous and lying higher, produce trees of small length; Bodm testifies as a thing very remarkeable, that he hath observed oakes in France not exceeding 3 or 4 feet. But this is no great wonder with ys in England: fith in the dry and barren plaines about Salifbury there are many examples not much different: All which, we can ascribe to no other cause then the want of monture. On the other fide as great or greater a defect of heat & moiffure, is found neere the Equatour, by reason of the externall heat of the Sunne; which in all plants and vegetalls, not only evaporates the moisture, and by consequence causeth dromb; but by the extraction of Internall beat, leaueth a greater cold behind, correspondent to that humour in a man, which we call Melancholy and choler-adult: But this extremity of heat caufing this detect of internall heat & moisture, we place not directly under the Aquinoctiall; because we have shewed it to be more temperat: but rather under the Tropickes, which by experience are found scorched with great heat. How subject these places under the Tropickes are to this sterility, we need goe no farther then Libia and Numidia to confirme; Places by the report of travailers, indigent not only of moods and trees, but almost of all vitals succours. Whereas the woods & forrefts dispersed almost in every region of Europe, and the more temperat parts of Asia, are celebrated of all writers, Yet whereas we have defined the cheifest places for the growth of woods to be toward the North, fo farre as 60 degrees or there abouts; we cannot warrant this as an absolute generall observation; because some places lying very low, & subject to much mosture, though fituat more Southerly, may enjoy this proportion, as we have formerly shewed of trees neare the River Hierotis recorded by Strabo, to have their mone shadowes of 5 surlongs, as also of certaine trees in America neere Rino Negro, wherein (as Peter Martyr writes) a King dwelt with all his samily. But these places howsoever situat towards the South are (as Geographers deliver vnto vs) most times of the yeare overwhelmed with Water, consisting all of marish grounds: yet these sew instances drawne from the particular disposition of the Earth it selfe, cannot much impeach our proposition, which takes notice only of the situation of the Earth, in respect of the cardinall points of North and South, compared with the heavens.

CHAP. XI.

Itherto have we treated of the Absolute adjuncts of the land, we are now to speake of the Relative, which imply a respect of the land to the sea.

2 From this Termination of the land with the sea, there ariseth a two fold distinction: The first is of the land into Continent and Ilands.

3 A Continent is a great quantity of land confifting of many kingdomes and Regions, not divided by Water, the one from the other:

other: An Iland is a parcell of land compassed round with the sea.

An Iland is called in Latin Infula, quafi in falo; because it flands in the fea,; fome would have it in English termed an Iland, as it were, Eye of the land: But this derivation feemes affected & not naturall; it might feeme more naturally to be derived from the French L' Ifle. But we will not dispute of the name: It is enough to vinderstand, that an Iland is a portion of the habitable Earth, every where environed with the sea, or at least with some great River: but this last sense seemes more improper then the other; yet oftentimes vied, as Meroe in Africa an Iland of Nilw, and the Iland of Eely in England. To this is opposed the Continent, as that land, which being not divided and separated by the sea, containes in it many empires and kingdomes, as Europe, Asia, Afruk, America; all which, as farce as we can yet gather, are vnited and joyned together, in one continuate land; Strabe affirmes out of this in his I booke and first chapter of Geographie, that the whole Earth is one Iland; fith all these knowne parts of the Earth, are compassed about with the sea on every fide: But this opinion cannot stand with reason, or moderne obse uation: First because this acception is too large; forasmuch as an Iland is properly taken for a smaller part, divided from the rest of the land, and opposed to the continent; whereas if this sense were admitted, the distinction of land into Contiwent and Iland would have no place, or at least the fame in a diverie respect, might be called a continent and an Iland. But it is plaine that Ilands were alwayes opposed to the continent, to which, although separat by Water, they were suppesed to belong, as to Europe, Afin, Africk, America, or Magellaniea, or some other as Geographer; have reduced them. Secondly, because it was a cold conjecture to thinke the whole world to cofift only of those parts, found out in Strabo's time: For besides the two parts of America since that time discourred by Columbia, another great portion is fince that time found out in the fouth, by the conjecture of Ferdinando de Our.

Quir, comming neere the quantity of Europe, Afia, & Africa. Which howfocuer it be round enuironed with fea, and therefore might feeme an Iland, yet in respect of the greatnes of it, and the many regions and kingdomes it containes, it may well be reputed a continent: To which many lefter Ilands belong.

I It is probable that llands were not from the first creation, but were made afterwards either by the vniuersall deluge, or some other violence of the Water.

It hath bin the opinion of diverse learned men, that Ilands were not only before the Flood, but from the first creation of the world: because they seeme no lesse to make for the ornament of the Earth, then divers Lakes and Rivers dispersed on the Land. But this argument seemes very weake; first because a greater ornament seemes to consist in vniformity then confusion; besides, the ornament must not be measured by our phantafie, but God's Almighty pleasure and will expressed in his own workmanship: and that he created Ilands in the beginning, is the thing in question. That Ilands were not from the Creation, many probable reasons are alleaged: First from the words in the I of Genefis: Dixit vero Dens, congregentur aqua que sub calo sunt, in locum unum, & apparent arida : & factum est ita; & vocavit Deus aridam, terrant; congregationeld, Aguarum appellavit maria. By which may be collected, that the waters were gathered together in their own place, by themselues, and therefore had no such intercourse betwixt Land and Land as now they have, admitting Ilands: wherefore it is more probable, that fuch Ilands as now appeare were either caused by that Vniversall Deluge of Noah, or by some other Accident : for it is most certaine that the Sea on the Land some-where gaines, and other-where in recompence of it, it loofeth againe: as may appeare by the 14 of Genesis; where it is faid of the comming together of certaine Kings: Hi omnes convenirunt in vallem Sylvestrem, quannuc est mare

falis: out of which it is evident that that parcell of ground which was a woody place in the time of Abraham, was before the time of Moles become the Salt Sea. Many examples of the like are given vs by Pliny in his Natural History, which we shall have occasion to vrge hereafter: And therefore it is no hard thing to believe, that fince the first beginning of the world all Ilands might be produced in this fort. Another argument by which they would establish this opinion, is that we see almost all Ilands of the Earth not onely inhabited of mankind, but also furnished with diverse kindes of Beasts, some tame, some wilde, some wholesome, some venomous, some viefull, some altogether unprofitable. Now it seemes very vnlikely that men being in elder times, and now also in most places of the Earth, altogether vnskilfull in the Art of Navigation, should venture so farre on the maine Ocean, to people Countries fo far distant; fith at this day, wherein Navigation is arrived at a great perfection, having the helps both of the Chart and Compasse, altogether vnknowne vnto the ancients, we fee most Nations very scrupulous in searching out farreremote Countryes. But admit this were ouercome by man's Industrie, which no doubt is much increased by Necesfity; yet cannot it be very probable, that fo many fundry kindes of beafts shou'd in this fort be transported: for howfocuer we conjecture concerning fuch beafts as necessarily serue for man's sustenance; yet seemes it hard to thinke that man should be so improvident and envious to the place of his own Habitation as to transport ravenous, venomous, vnwholesome, & vnprofitable creatures: for by no other meanes but by transportation can such beasts be imagined to be brought into Ilands: For the first original of all creatures in the Creation was in or neare Paradice, which we shall proue to have bin in the Continent of Asia; the second seminary was in the Arke, which by the restimony of the Scriptures was fust disburthened in the fame Continent. How from hence they should spread themselves into Ilands, is the doubt. Impossible it seemes they should swimme so farre; for what Creature will venture it selfe on the maine Ocean being by a naturall Aa * infti net

inflinct fearefull of death, and earefull of his own preferuats on: Whence it is more likely to imagine, that these parcels of land being first furnished with such creatures, were afterwards by the violence of the flood, or form other like Accident torne off from the maine Continent, retaining still such Creatures as it had before. But here S. Anguftine feemes to avoide this Argument two wayes: It is not (faith he) incredible, that wild and faunge beafts might be transported from one Country to another by Sea : either by Men for the delight of Hunting; or else by the helpe of Angels by God's Commandement, or at least permission. This answer seemes very probable aswell for it selfe, supposing nothing impossible impossible to Almighty God, as also for the authority of the Authour. But with all reverence to the Authour, whom all the Christian Churches are bound to honour, this affertion is not so firongly fortified to enforce affent. And first it is not very likely that pleafure with men should so farre over-Iway the generall weale and profit, as to transport so many ravenous and hurtfull beafts, for meere hunting sports and recreation. Secondly, the chase of some, as Lions, Leopards, and fuch like, bath more danger in it then sport or delight; and if to be these were conveyed ouer Sea for such ends, yet it is very probable, they would keepe them rather close and imprifoned to ferue occasion, then to let them loofe & free for farther propagation Finally whereas he ascribes the transportation of them to the ministery of Angels; no man can deny but this may be possible; because by the permission of Almighty God they might effect greater matters. Yet seemes this not fo likely as the other, because we find that in the generall preferuition of all creatures in the Arke, he vied the ordinary helpe of Naturall meanes, alt ough directed and affitted by a dinine power: And if God eff cted greater matters in this fort, why may we not believe it of things of leffer moment and neceffity? But of this we have spoken before. Another reason for our opinion that Ilands were not before the flood, or at least from the Creation, is viged by Verstegan a late Writer in this mauner: There is nothing broken (faith he) that hath not bin whole:

whole; which he fets downe as an infallible principle : for howbeit Nature doth sometimes against her own intent commit fome errours, infomuch as the things formed have either too much, or too litle; yet bringeth the forth nothing broken or disseuered; but such as it is, it is alwayes whole and not broken, except afterwards by some accident. And if Nature, e chand-maide of God, neuer miffeth this perfection much more ought wato believe that God the Father of Nature in the first Creation lett no part thereof broken and unperfect. But enery man may fee by ordinary observation, that the Clif:s and bounds of the Sea (as not being by God in the creation fo formed) leeme not onely fewered and broken, but (as it were) cut freight and freep downerrom the top to the bottome, not stooping or declining by degrees; as we see in Inland Hills in their delcent vnto the vallyes. The forceable breach of the and (as we pretend) by the Sea fretting through some narrow place, seemes the more to be confirmed in that we find it not fleep towards the Land, where the Land declines by a floping descent as in other places; but rather towards the Sea in such fore, as both the fides of a narrow and streite Sea oftentimes in the nature of the foil, and conformity of figure, seeme to answere one the other; only shewing the want of fubiliance betwixt them which is loft. It may hence be objected that many other hills and rocky places of Inland Countryes, seeme in like manner as broken & steep downe as these clifts bounding the Ocean; as also that the clifts towards the Sea are broken higher vo then any wayes the Sea could be imagined to ascend. To this we answere, first that rocks on the dry land many times feeme broken, when indeed they are not, being by Nature fashioned craggie and vneuen: Secondly, whereas Hells in Inland countries feeme broken, this might proceede heretofore by Earthquakes which have oftentimes bin observed to produce such effects as it hath lately beene knowne to doe in a Town called Plears in the Grifous Countrey neare the Alpes: and for the appearance of fuch breaches in the tops of cliffs about the afcent of the waters, t might be caused by the violence of the Sea waves, fretting and eating

out the fides of them beneath the bottome; whence it happens that the higher part for want of vnder-propping must needes fall and breake off from the other. This Argument of our said Authoris by him back't with another, drawne from the name of a eliffe, which in our ancient language is drawne from cleauing or breaking off: which appellation is neuer giuen to our Inland Hils, but only to such as terminate & compasse in the Sea. These reasons make the matter seeme probable; yet condemne I not the other as absurd, because it may probably be desended, and backt with the authority of many grave Authors.

4 A second Distinction ariseth out of the termination of the Land with the Sea: For

either it is vniforme or various.

5 An uniforme termination I call that which without any notable difference inclines

more to euennesse and Regularity.

It is manifest that the Sea-waves working on the Land violently, and not naturally, seldome or never so bound and compasset he Land, as to reduce it to a regular and perfect figure.
But yet because in some places it comes somewhat neare to
such a figure, somewhere it is very farre off; we thought it sit
to insert this distinction. This inclination to a Regular figure
is some-where square, consisting of Right-lines, some-where
circular; an example of the former we have in Spaine, which
on the Nrih side, & the West is bounded more streitly, comming neere a right-line; of the other in Africke, whose NorthWest side from the Mediterranean streits to Guinea steemes in
some sort circular.

6 A various Termination is that wherein the bounds are crooked, and as it were indented with crekes and turnings. Heere three things things are remarkeable. 1 . Peninfula, Ist-

7 A Peninsula is a part of land every where environed with the sea, excepting in one part, where it is knit vnto the maine land: An Istmus is a narrow land betwixt two seas: A Promontorie is a high mountaine bending it selfe into the sea: the head whereof is called a Cape.

These three are remarkeable accidents growing out of the Termination of the land with the fea, and belonging as well to continents as llands. The first we call Peninfula, quali pene Infula, termed of the Gracians Cherfonefus, although I find this name oftner given to the Istmus then the Peninfula. Amongst the Peninsulas the most famous are Africa, Scandia, Taurica Chersonesies, Peloponnesius, and America Permana. That litle parcell of land which joynes this Peninfula with the maine land, we call an Istmus, which is a narrow neck of land be wixt two feas, joyning two Continants; fuch as are Istmus Corintheasus and Istmus Cimbricus, more famous are those two narrow lands, whereof the one lieth betwixt Peruana, and Mexico in America, the other dividing Africk from Afia. A Promontorie is a great mountaine stretching it selfe farre into the fea: whole extreamity is called a Cape or liead. of which the most remarkeable are the Cape of good hope in Africk, 2. The Cape of St, Vincent in Protugall, 3. The Cape of Comary in Afia. 4. The Cape de la viltoria in America. Our observation concerning this distinction shall be comprifed in this Theoreme.

Peninsula's by the violence of the seafret.

ting through the Istmus, have oftentimes

A a * 3 bin

bin turned into Ilands: and contrariwife sometimes Peninsulis by diminution of the

Sea made of Flands.

This proposition is not hard to proue, if any credit ought to be given to ancient writers: for it is commonly related. that Sicily was heeretofore joyned to Italy, Cyprus to Syria. Eubar with Bastia, Besbieum with Tythinia; all which at this day are Ilands separated and divided from the continent. The like hath bin conjectured of our Britanny, which some in:agined heererofore to have bin joyned with the continent of France, about Dover and Calais: as may feeme probably to be gathered out of the correspondency of the Cliffs (whereof we have spoken in this chapter before) the agreement of the foile, the smallnes of the distance, and many more arguments remembred by vs elfe-where. Also it hath bin observed on the otherfide, that the fea in some places leaving his ancient bounds, hath joyned some Hands to the land, making Penin-Inlas of Ilands. In this fort if we believe antiquity was Antiffa iouned to Lefbos, Zophirium to Halicarnassus, Ethula to Mindus, Promifeon to Miletum, Narthucula to the Promontory of Parthenius: In these antiquities it behooues every man to judge without partiallity, according to reason, not ascribing too much to fabulous narrations, wherein those ages did abound, neither yet shewing himselfe too incredulous: For almuch as we cannot charge thefe Authors with any manifest absurdity. The speciall and particular arguments by which we should establish our affertion, we must according to the rules of method referue to the speciall part, where we shall treat of speciall countries. I was a first of a sound of a section of the sectio

le respectable de la company d

CHAP. XII.

F the perpetuall Accidents of the land, we have spoken somewhat: it remaines in this place we treat of the casuall.

2 The casuall I call such as happen not ordinarily at all times: such as are Inpuda-

tions and Earth-quakes.

3 An Inundation is an ouerwhelming of the

land by Water.

Howfoeuer it be certaine out of holy Scriptures, that Ged hath fet the fea his certaine bounds and limits, which it cannot passe: yer the same God sometimes to shew his speciall judgment on some place or age, hith extraordinarily permitted the sea sometimes to breake his appointed limits, and inuade the Iurid ction of the land. This we call a deluge or Invidation. The inundations which ever have bin observed on the Earth, are of two forts, either wninerfall or partieslar: An uninerfall is that whereby the whole face of the Earth is couered with water; whereof we have only two examples: The first was in the first creation of the world, when (as we read in the Scriptures) the whole face of the Earth was round inueloped with Water, which covered the tops of the highest mountaines, till such time as God by a supernaturall hand, made a separation of the Waters from the dry land: But this is improperly call'd an Invadation, because, the same properly taken implies as much as an ouer-flowing of that which was dry land before: The second(as we read in Genefis) happened in the time of Noah, when God for the fin of man, drowned the whole world, breaking open the cataracts of heaven, and loofing the springs of the deep. Particular inundations are such, as are not ouer the whole Earth, but in some particular places or regions; Such a deluge (according to Genebrardus) happened in the time of Enos, wherein a third part of the Earth was drowned. The like is spoken of Ogyges King of Athens, that in his time happened a very great inundation, which drowned all the confines and coasts of Atticas & Achaia even to the Agean sea: In which time it was thought that Buras & Helica Cities of Achaia, were swallowed vp; whereof Ovid in his Metamorphosis, speakes thus.

Si quaras Helicen & Buran Achaides urbes Invenies (ub agnis:

Buras and Helice on Achaian ground

Are fought in vaine, but vnder leas are found.

As famous was the Invadation of Theffaly in Dencalions time mentioned not only by profane writers and Poets, but also by St. Angustin, Ierom, and Ensebins. which would have it to happen in the time of Cranaus, who next after Cecrops governed Athens. This invadation was exceeding great, extending it selfe not only ouer all Thesaly and the regions adioyning westward, but ouerwhelmed the greatest part of Italy. The same or other happening neere the same time, oppressed Ægypt, if Eusebius may obraine credit. Hence some would have the people of Italy to have bin called Vmbry(25 Pliny & Solinus report) quia ab imbribus diluvi superfuissent. But this Etymologie scemes too farre fetcht. There are also two other notable Inundations mentioned by ancient writers, which fell out in Egypt from the River Nilus; whereof the first covered all the neither Egypt, which was subject to Promethens, and hence (as Natabis Comes observes) was the fable drawne of the vulture lighting on Promethem liner, afterwards flaine by Hercules. For (as Diodoriu Siculiu obserues) the River Nilus for the swiftnes of his course was in ancient time called an Engle. This River afterwards did Hercules by his his great skill and judgment theiten and bound, reducing it into narrow channels: whence some Greek Poëts turning Hersules labouts into sables, saigned that Hercules slew the Eagle which ted on Promethem brest, meaning that he deduced Promethem out of that sorrow and losse which he and his people sustained by that Innudation. The sec nd of these Egyptian flouds happened about Pharus in Egypt, where Alexander the great built Alexandria. To these may be added many more of lesser moment, as well in ancient times as i our dayes: As that of Belgia in some parts mentioned before, on another occasion; and not many yeares since in some parts of Somersetshire with vs in Britanny.

1 No universall Inundation of the Earth can be Naturall: The other may depend on some

Naturall causes.

Of the causes of Inundations many disputes have beene amonght Natural Phil Sophers: some have trusted so farre to Nature, that they have ascribed not only particular Inundations, but that winerfall Deluge in the time of Noah to fecond causes: of this opinion was Henricus Meclumis a Schollar of Alberius Magnus, who in his Commentaries upon the g cat Con unctions of Albamazar, observed that before Noah's flood, chanced a conjunction of Inpiter and Saturne in the last degree of Cancer, against the constellation fince tormed Argo's ship: out of which he would needes collect, that the floud of Noah might have bin fore-showne; because Cancer is a watry figne, and the house of the Moone being miffrisse of the Sea and all meif bodies according to Afteologie: which opinion was afterwards confirmed by Petrus de Allisco, who affirme in his Comment voon Genesis, that although Noah did well know this flood by diume Reuelacion; yet this conjunction being fon table, he could not be ignorant of the causes thereof; for those were not only fignes, but also apparant causes by vertue received from the first cause, which is God himselfe. Further to confirme this affertion he would have Moles by the entaracts of Heaten, to have meant the Bb* great

the great & watry conjunction of the Planets. A reason whereof he feemes to alleage, because it is likely that God would thew some signe in the Heauens, by which all men might be warned to for fake their wicked courfes. But not withftanding this curious opinion, I rather cleaue to those which think this deluge to be meerely supernaturall, which I am induced to belieue for diuers caules vrged by worthy writers. First, because this is let downe in holy Scripture for a chiefe token or marke of Noah's extraordinary faith and dependance vpon God's promifes; which had bin much diminished, and of small moment, had it any way bin grounded on the fore-fight of fecond cruses. For this was no more then might have bin discouered to the rest of the wicked worldlings, who no doubt would in some fort have prouided for their safety, had they received any firme perswasion of this dreadfull deluge. which others add a fecond reason, that second causes of themsclues, without any change or alteration, are not able to produce fuch an admirable effect as the drowning of the whole World: for it is not convenient (lay they) that God, the Author of Nature should so dispose and direct the second causes, that they might of themselves be able to invert the order of the Vniuerie, and ouer-whelme the whole Earth, which he gave man for his habitation. But this reason is thought ve y weake, forafacuch as it feemeth to imply a new creation: The conceit of a new Creation is pronounced by a learned Countryman of ours, both whlearned and foolist; for whereas it is written (faith he) that the fountaines of the deepe were broken open, it cannot otherwife be vnderstood, the I that the waters for looke the very bowels of the Earth, and all whatfocuer therein was disperfed made an eruption through the face of the Earth. Now if we compare the hight of the waters in this deluge about the highest mountaines, being onely 15 cubits, with the depth of the femi-diameter of the Earth to the Center, we shall not find it impossible, answering reason with reason, that all these waters dispersed under the Earth, should to far extend as to drown the whole Earth: for the femidianeter of the Earth (as Aftronomers teach) is not about 3500 miles.

miles, wherein the waters contained and dispersed, may be fusficient for the hight of the greatest mountaines, which never attaine 30 miles vpright: whereas this distance of 20 miles is found in the depth of the Earth 116 times. Secondly theextension of the Ayre being exceeding great, it might pleaseGod to condensate and thicken a great part thereof, which might concurre to this Inundation. We willingly affent to the worthy Authour, that this Inundation might be performed without any new creation: Notwithstanding we cannot hence collect that it was Naturall. But to compose the difference the better, and to shew how farre Nature had a hand in this admirable effect, we will thus diffinguish; that an effect may be called Naturall two manner of wayes: First in regard of the causes themselves: Secondly in respect of the Direction and Application of the causes. If we consider the meere secondary and instrumentall causes, we might call this effect Naturall, because it was partly performed by their helpe and concurrence. But if we confider the mutuall application and consunction of these second causes together with the first cause, which extraordinarily fet them aworke, we must needes acknowledge it to be supernaturall. For other particular Inundations in particular Regions we may more fafely terme them Naturall, as directed and stirred up by second causes, working no otherwise, then according to their own naturall disposition. Two causes concurring together, are here most notable, wherof the first is the great consunction of watry Planets working on the water their proper subiedt: the other the weakenes of the bounds and bankes restraining the water, which by processe of time weare out and fuffer breaches: both these causes fometimes concurring together, cause an Inundation: which affertion we may lawfully accept, but with this caution, that Almighty God working by second causes, neuerthelesse directs them oftentimes to supernaturalland extraordinary ends.

2 Particular alterations have happened to Bounds of Regions by Particular Inundations.

Howfoeuer fome inundation have not continued long, but after a small time left the Earth to her own possession; yet others have bin of such violence, as they have bin found to have fretted away, added, or at least altered the bounds and limits of places; which befides diverfe examples produced by vo, in our former chapter, Ariftotle feeines to acknowledge in the I booke of his Meters, the 14 Chapter, where he faith, that by fuch Accidents formetimes the Continent and firme land is turned into the Sea, and other-where the Sea hath refigned places to the Land: for fith the agitation or mouing of the water depends ordinarily vpon the vertue of heanew's bodies, if it should happen that those starres should meet in conjunction, which are most forceable and effectuall for furring vp o' tempel's and flouds, the Sea is knowne to rage beyond measure, either leaving her ancient bounds, or che viurping new. By this meanes (as we have shewed in the former Chapter) some llands have bin joyned to the Land, & fome Peninsula's separated from the Land, and made Ilands: some-where the Sea hath bin observed for a great space to leavet e Land naked, as Verstegan coniectures of the most part of Beiges, which he faves, was in ancient time couered with water; which befides many other arguments he labours to prove out of the multitude of fish-shells, and fish bones, found euery-where faire vider ground about Holland, and the coasts thereabouts, which being digged up in such abundance, and from fuch depthes, could not (faith he) proceed from any other cause then the Sea, which covered the whole Country, and threwed it with fishes. Lastly, that the Sea might feeme aswell to get as loose, she hath shewed her power in taking away and Iwallowing vp fome Regions and Cities, which before were extant: Such fortune had Pyrrha and Antificabout Ma tis, Helice and Bura before mentioned in the Cornethia's ftraites: fome have bin of opinion that the whole Mediterranean within Hereicles pillars, was in time palt habitable land, till it gave way to the violence of the Seas invasion: But in this I credit nothing without farther gr und. The like uncertainties are also related of the Atlantick Hards, greater

greater then all Africa, swallowed up of the Ocean: which Columbus was said in a fort to have discovered in the Sea, finding a great shallow fraught with weedes, where he supposed this great Iland to have stood. But I rather believe that this Atlantick Iland spoken of by Plato, was either a Poetscall siction, as Moores Vtopia with us, or at least the Continent of America perhaps in those dayes obscurely discovered, but the discovery lost against to after ages.

Certaine Regions by reason of great Rivers are subject to certaine Anniuersary Inundations, which commonly happen betwint the Tropicks in the summer, without the

Tropicks in the winter.

The former clause is proved by experience almost in all great Rivers in the world, which at fome times of the yeare Iwell higher, overflowing their bankes, and drowning a part of the land about them. But this happens not alike in all places; for in Rivers included within the Tropickes, as Willis & Niger in Africa, and Crerchana in America with others the e-about, this Anniner fary Invindation, is in the Summer. elfe where it is commonly in the Winter. For the former thefe canles may be affigned; I The melting of the from on the Tops of the great mountaines in those parts, which is greateft of all, whe the Sun is neerest or verticall vinto them, which we are to accompt their Summer. 2 The daily Raines and showres such regions are subject voto; These showres are much more frequent and greater when the Sunne is neerest their verticall point or in it: The reason whereof we have formerly thewed to be this: That the Sun daily in those parts drawes vp more vapours, then he can diffipate and confume: Whence meeting with the cold of the middle Region of the Arrethey are condenfated into drops, and fo turned into Raine. For the later caft in rivers, f tuat without the Tropickes, commonly happens the contrary, to wit, that fuch Inundations happen rather in the winter then the Summer, Bb * 3 whereof whereof these reasons may be rendred. I Because Raine and shownes whereof such ouer-flowing are ingendred in those parts, are more frequent in winter then in the Summer. 2 whereas neere the £quatour, the shown is knowne to melt with the sun from the Tops of high mountaines, in other parts it seldome or neuer melts at all, (as may be thought) under the Pole or thereabouts; or else, if it niels, it happens, (as in the temperat Zones we see it doth) oftner by raine, then the heat of the Sunne.

4 Next are we to speake of Earthquakes: An Earthquake is a sensible motion and shaking of the parts of the Earth.

Amongst other remarkeable affections of a place, which are not so ordinary, an Earthquake hath no finall confideration, being oftentimes a meanes which God vieth to fliew some great and extraordinary indgment. But not to spend more on this subject then may seeme meete for Geography. we will shew the causes & kinds of it, by which we may the fooner come to learne what Regions and places of the Earth are most subject to this affection, which is necessary of a Cosmographer to be knowne. Concerning the causes of it. much dispute hath bin among Philosophers: some, haue ridiculoufly affirmed, that the Earth is alwing creature, & suppose with no leffe, if not greater absurdity, that the Earth being in good temper, doth rest and settle quietly according to her naturall disposition: From which temper if she be any way removed, as if the were fick, or pain'd in fome part, the thakes & thivers. The relation of this opinion is a sufficient confutation. Thales Milefins would have the Earth as a shippe to swimme on the Waters, which being somtimes as a vessell by tempests turned on one side too much, it takes a great quantity of water, which is the cause of Earthquakes : But this opinion is a poeticall fiction. Litle more probable is the opinion of Demorritm, that the Earth drinking in raine water more then her caverns can well containe, the water reverberaberated backe is cause of such a motion. But who can imagine that drops of rainefalling into the Earth can be reverberated backe, with such violence to cause such an extraordinary motion of the Earth? Anaximenes Mulesus was of opinion that the Earth her selfe was cause of her owne motion; for the parts of it being taken out (as it were) and broken, fall downe somtimes into a great depth, causing the vpper sace of it to shake and tremble; to which opinion also Seneca seems to subscribe in the 6. book of his natural questions the to chapter; To which also accords the Philosophical Poet Lucretius in these words.

Terra superna tremst magnis concustarninis, Subter whi ingentes speluncia subrust at as, Quippe cadunt toti montes, magnod, repense Concustu late dispergunt inde Tremores, Et merito; quoniam plaustris concusta trems scuns Testa wiam propter non magno pondere tota.

The opper Earth seaz'd with great ruines shakes, When surrowed age her vast ribbes ouertakes.

For mountaines great fall downe, and with the blowe. The Tremblings are dispersed to and fro.

Not without reason; when a small-fiz'd waise. Makes houses neere the way to shake amaine.

This last opinion seemes to carry more shew of probability then the former-neither can any man deny, that sometimes the Earth in some parts, may shake by the breaking downe of some satternamen parts, whole suddain and violent motion may cause the rest being continuate to entertaine the like convulsion. But yet more generall seemes the opinion of Aristotle who would have Earthquakes to proceed from a spring viapour included in the bowells of the Earth, as he testifies in the 2 of his Meteours the 7 chapter. For this vapour stading no way to passe out, is ensorted to return backe; and barred any passage out, seekes every corner: and while it labours

bours to breake open some place for going forth, it makes a tumultuous motion, which is the Earthquake. Now least it should seeme improbable that so great a masse of Earth should be moved, and shaken, by so thinne and rarefied body as is a fume or vapour; Aristotle in the same place shewes the admirable force of winds as well vpon the Aire, as on the bodies of living creatures: In the Aire; because experence Thewes that being flirred up by a windy vapour it forntimes is knowne to moue rockes from one place to another, to pluck vp trees and shrubbs by the rootes; and sometimes to throw down the strongest and most stately buildings: In mans body, because by the stirring vp and agitation of the spirits, which are the Instruments of vitall and animall functions, sometimes one fick man can doe that, which cannot be performed by many stronger and abler men; as it hash bin tried sometimes, that a Frantick man hath broken very ftrong chaines, wherewith he hath bin bound; which many other men could not doe. Neither on the other fide, capit feeme ftrange, that many and great exhalations, vapours, and spirits should be ingendred under the Earth; For almuch as the Earth is heated many waies. Many waies may be specified whence such fumes should arife; as, first, from the sunne and starres; Secondly, from the subterranean fires hid in the bowells of the Earth; Thirdly, in the winter-time by an Antiperoftalis, the heat collecting it felfe downward to the inner parts of the Earth, which was before in the outward parts of it: The argument by which Ariffetle would confirme this opinion, is drawne as well from the time, as from the places, wherein Earthquakes viually happen: from the time; because then most Earthquakes are observed to be, when most exhalations are inclosed in the bowells of the Earth; to wit, in the fpringtime and the Autumne. From the places; because, for the most part spongie & hollow Regions, which may drink in a greater quantity of exhalations, are commonly most subject vinto it: for although many exhalations are dayly inclosed in the womb of the Earth, yet Earthquakes fall but feldome; because the matter is seldome so strong and violent as to shake the

the Earth: Wherefore some Philosophers haue expressed three principall wayes which make this Earth-quake: first when a great quantity of exhalations is fuddenly ingendred, which for the greatnesse of it cannot be contained in so litle a space: for then being almost choked, it feekes a way to fly forth: Secondly, when the Earth is condensated by cold, and drives the exhalation from one place to another, which flying hither and thicher, shakes and frikes the Earth: Thirdly when the exhalation, the cold compassing it round by an Antiperistalis, begets heat within it, and to is rarified : for fo being vnable any longer to confine it felfe to it's former place, it breakes forth. and fo fbakes the Earth: We must here note by the way, that not onely exhalations are cause of the distemperature in the Earth, but also subterranean fi es and mindes: all which by some are judged to be of equal force in this action : for the division of Earthquakes so farre forth as it concernes the difference of places, we must vinderstad, that it may be either Visverfall or particular: An unmerfall Earth-quake is that which shakes all the whole Earth in every part, at least in the vpper face: whereof (I suppose) no naturall cause can be given, but the immediate and miraculous power of God: fuch an Earthquake happened at the time of our Saniour's possion, whereof Didymus a grave and ancient Writer left record. But that which is faid to have happened in the time of Valentinian, mentioned by Orofins in his 7 book of Histories, & 22 Chapter, is thought by grave Authoris to be no vinuerfall Earthquake, how focuer for the large extent of it, it was thought to be generall. A particular Earthquakers that which is bounded in some one or more particular places, which for the causes before-alleaged cannot be so farre extended, because the cavernes and convexities of the Earth, where fuch vapours & exhalations are contained, cannot be ordinarily fo great as to extend to many kingdomes and Regions.

Regions extreame cold or extreamehot are not so subject to Earth-quakes asplaces of a Cc* Middle Middle temper.

The reason is, because in places extreame sold, exhalations are not so toone ingendred, and in so great a quantity as in other parts: on the other side in places which are extreame hos, the exhalations which are bred, are soone consumed with excesse of he it both which may be confirmed by Instances. It is observed that in the cold Northerns parts (as Olaus Magnas writes in his so booke and 12 Chapter) Earthquakes are very seldome or never: so it is observed by Pliny in his 2 book and 18 Chapter: and Albertus Magnus in his 3 book of Meteoms tract. 2: That places which are very hos, as Agypt, are seldome croubled with this shaking of the Earth: whereas places betwixt both, which are seated in a more temperat climate, find it not so strange.

i Holl w and si ongie places are more subiest to Earth-quakes then tolide and compasted sovies.

We must here understand that hollow places are either such as iye open to the Aire, or are hollow onely vinder, and close vpward. The former fort are not at all subject to the molettation of Earth quakes, because the exhalations fly out without impediment : but the latter being more apt to ingender and recaine fuch matter, must of necessity be more troubled. This is most plainly observed in Phrygis, Italia, Caria, Lydia, wherein such motions are more frequent. To confirme this a lighe farther, we observe that hilly and mountainous places, fuffer this violence oftner then other parts; because there most commonly cavernes and concavities are more frequent then in plaine countryes. But here by the way may be obiected, that fandy and flimy countryes are many times more free fro n Earthquakes then other places, an instance whereof was gine before in Egypt, where in neuer any Earth-quake (as most Authors affirme) or at least but one (as Seneca)hath bin observed. The reason may be given, that sandy places without any strife fuffer the exhalacions to disperse themselves:

that flimy places want sufficient receptacles to entertaine them.

3 Hands are more often troubled with Earth-

quakes then the Continent.

This laue they found to be true in many Ilands of the Mediterranean Sea, and others also; chiefly in Cyprus, Suclia, Endowa, Tyrus, Angria, Lappara, and the Molucco llands borwixt the East and West-Indies. The cause some would have to be the Antipersstants or circumstancy of the waters, which is apt to engender greater store of exhautions in the Earth-But neverthelesse that Ilands are more subject to Earth-quakes then Continents I dare affirme no otherwise then piobable; becuse some places in the Continent seems very much affected, especially in Europe, about other places, Constantinople and Basilea, if we credite authors which have written of this matter; in Asia, Chima, and other Regions a spoyning thereunto.

CHAP. XIII.

He Naturall Affections of the Land haue hitherto bin declared: We are in the next place to treate of the Civill: Those we terme Civill which concerne the Inhabitants.

2 An Inhabitant is a man dwelling in a cer-

taine place.

The name of an Inhalitant (as we have before noted) may be taken either generally for any living creature, refiding in a certaine place, in which sense brante beasts may be called Inhabitants; which sense from its only metaphoricall; or cise for a

Reasonable living creature, whose abode is settled in any place or Region, in which sense we here take it. The consideration of the Inhabitants we have reserved for this last Treatise; sollowing as well the methode of the first creation, as of Moses in the narration. For God proceeding in the first Creation according to the order of Generation, from the more unperfect to the perfect, created not man before such time as he had turnished the Earth with all things agreeable and necessary for his vie; to which alludes the Poet in these Verses:

Santtius his animal mentifá capacius alsa Di crát adhuc & quoddominari in catera possit, Natus homo est.---

More facred and of vader standing minde, A creature wants to gouerne euery kinde;

So man begunue---

Of the Nature, Proprieties, Dignities, and other accidents of this principall creature, there wants no discouery; fith large volumes are stuffed with this theame, and every man which knowes himselfe can prevent me in this subject: I will here speake of him so far forth as he is an Inhabitant or dweller on the Earth.

In the Inhabitants we are to consider two things: either the Originall, or the Diffostion.

4 The Original is the off-spring whence all

Inhabitants tooke their beginning.

Concerning the originall of people of the Earth, we are to observe two things; First, the Distinction of originall; Secondly, the manner of Invention: For the first, we must note that all Inhabitants of the Earth, have a three-fold originall or beginning. The first was from the first Creation, the second was immediatly after the generall deluge, wherein all the seminary of living creatures was preserved in the Arke: The third, is the first stocke or originall of each severall nation: For this last, it is a matter which we cannot here so well de-

fine, till we come to the particular description of each Religion, to which it properly belongs. It shall be enough in this generall part, to speake of the two first, as farre as approved Historie and observation shall direct vs: For the manner of finding out the original of Nations, these rules are given vs by Bodin in his other chapter of the methode of Historie. The first is by the testimonie fapproued Authors. The second is by the markes and footesteps of Languages. The third may be drawne from the limits and knowne bounds and fituation of Countries. This knowledge of the originall of Nations, hath bin a matter of no small importance: For (as Bodin obferues) there is nothing which hath more excercised the wies of writers, or caused more civil discords and ruines of diuerfe commonwealths, then the contention about the first originall of nations: which sarres and contentions (as I take it) fpring from no other ground then the naturall pride in the minds of men, and the affection of Nobslity: where by it often comes to paffe, that fuch men as have rifen to greatnes, by their Wealth, villanies, or other fuch like meanes, have afterwards, to continue and bolfter vp their vfurped dignities. fought out new pedegrees and Ancesters, to set a glosse vpon their owne base beginnings; a humor in our daies more affected, then praise-worthy; not only of privat persons, but of whole nations, which runne farre off to feek out their first originall, which with more ease and certainty, they might find nearer home. To let passe other examples we need goeno farther then the French and the Britanes, both which labour as much as may be, to denue their first original! from the Troians. The first from the linage of Helter, the other from Anaas; as if more glory were to be derived from Troian fugitimes, then from the valiant nation of the ancient Gauls and Germans, from whom they might deriue a truer and a more certaine descent. The conf deration of this antiquity of nations fo farre forth as it concernes our Geographicall discourse, referring matters of more specialty to our special part, we will comprise in these Theoremes.

All Nations had their first originall from one stock, whence afterwards they became divided.

We must heere vnderstand (as we have before noted) that all Nations have a three fold originall, the first before the vmuerfall deluge, the other foone after, the later long after. For the first, no doubt can be made by such as credit the truth of holy Scriptures, but it was from Adam the first father of mankind: For the last, it is doubtfull and various, and therefore cannot well be handled in generall, before we come to the description of particular countries; where we are determined to make a fearch as neere as can be in to their original: But thac which we chiefly heere note is the second oflyring of mankind foone after the flood: For certaine it is that all mankind was confined to the familie of Noah in the Arke, so that their first originall must be drawne from the Arke, and that place where the arke rested, presently vpon the falling of the waters: which we shall proue to be farre Eastward. Hence is the manifold arrogancy of many natious well sisfcourred; for amonght the ancients fome have fomuch affected the antiquity of their race, that forgetting their humane codition, they have derived their nobility from the Gods. Which humour hath not only invaded the minds & affections of foolish & ignorant men, but also of such as have stood in great opinion and estimation of wildome & vertue: In somuch as Calar in a certaine oration to the people of Rome, was not ashained to boaft, that he was descended by his Fathers side from the Gods by his mother from Kings: As allo Aristotle derived his of-Spring from Apollo and Afeulapine: which strang off ctation was little leffe in people of lower and bafer condition. who either being vtterly ignorant of their owne offpring, or at least diffembling it , for the hate they bore to frangers have called themselves Aung Doras which is as much to fay, as a people bred of the same region, not fetching their deleent from any other nation: In which fense Arifides in Panathe-

wais glues the greatest nobility to the Athenians; to wit, that being borne of the Earth the mother of the Gods, they deriued not their descent from any other forraine countrie; and this errour is observed not only amongst the ancient, but al o with the newer writers, to be fo common, that Folydore Virgill otherwise a prudent writer, aftirmes the Britaines to be a people taking their originall from the Inland countries and not derived farther. The like is written by Athamerus that the German nation being first bred in Germany owed their originall to no other; Which he labours to confirme out of Tacitus, Sabellicus, and Sepontinus. But (as Bodin speakes ingenuoully)the ancient might well be excused in this errour: But thele men are subject to great reprehension: 1. Because they being Ch oftians feeme to releast the authority of holy Scriptures, which testifie that all mankind was derived fro the felffam originall, being (as we have faid) a'l confined in the Arke of Noah. 2 Because by this meanes, giving constions no other originall, then from their owne countrie, they diffract & divide each one from the mutuall four and fociety of other Nations. For besides many other reasons which moved Mofes to write of the Genealogies of people, this one feemes not the leaft, that men should understand themselves to be all (as it were) kinne, and descended from the same originall; then which there is no greater meanes to conciliate and ioyne mens affections for mutuall amitie and convertation. As it is reported of Diomedes & Glaucus and many others, who being armed to one anothers ruine and ouerthrow, haue bin drawne to breake off their hatred by the meere pretence and flew of contanguin tie. But these who so arrogantly boast themselnes to be sonnes of the Earth, not beholding to any other country for their offering, ftriue to breake, in funder the bonds of fociety betwixt nations, which Gods word and the Law of Nations binds vs to observe. Hence grow those mortall haireds and heart-burnings betwixt diverse countries, as of the Egyptians against the Hebrewes, of the Greeks against the Latines, wherein they perfecuted one the other extreamly. Hence came it to pale that fran ers amongst the Romanes

were called enemies, as the name of Welch-men with the Germans fignifieth as much as a forrainer; wherein they seeme much to degenerate from the ancient hospitality of their Ancestors, for which they have bin much praised. Finally from this one root spring those infamous libels cast out of one Nation against another, written by such fire-brands as delight in nothing more then diffention; but how much better were it to recoucise all people out of this affured ground of consanguinity, sith Religion perswades more to charity and agreement, then to fastions and contentions. But this I leave to the Divine, whom it more properly concernes.

2 The first inhabitants of the Earth were planted in Paradise, and thence translated to

For the confirmation of this point we need no farther proof then the authority of God himselfe, speaking in his word, whereon all truth is grounded; But of the place of Paradys, where we place the first habitation, sundry disputes have bin

the places neare adioyning.

amongst Divines sufficiently examined, of late by a judicious and worthy writer in his History of the world. Which track being too te jious to insert, we will contract as fatre as concernes our purpose. First therefore it would seeme ineete that we examine their opinion, which hold this Historie of Paradise to be a meere Allegory: Of this opinion were Origen, Philosudam, Fran. Georgim with many others: who by the source rimers of Paradise would have to be understood the toure cardinall vertues: as by the Tree of knowledge, sapience or wisedome: To which opinion also St. Ambrose seemes to adhere: who would have that by Paradise should be meant the soule or mind, by Adam the understanding, by Eue the sense, by the

ferpens delectation, by the rest of the trees the vertues of the mind: Against the Fathers themselves I will not invergh, sich some men suppose their conceits to be rather adultions, then conclusions. But against the opinion it selfe, many teasons may be drawne to prove there was a true local Paradse Eastwards first out of the text it selfe, which saith; For out of the

ground

5º Walter Ramieigh.

ground made the Lord God to grow enery tree pleasant to the fight, and good for meats: by the proofe of which Story it feemes that God first created man out of the garden as it were in the world at large, and then put him in this garden: the end whereof is expressed to are se and manure it; Paradise being a garden filled with plants and trees, pleafant to behold. and good for meate: which proueth that Paradife was a terrestrial garden. Secondly, to expresse it more plainly, he averreth that it was watred with a river (pringing out of a Region called Eden, being a Country neare vnto Canaan in Melopotamia as Executed witneffeth. Thirdly Epiphanim and S: Hierome vrge to this effect; if Paradife were fuch an Allegory. then were there no Rivers, no place out of which they fprung. no Ene, no Adam, and so the whole History should be turned into a meere fable or poëticall fistion. Fourthly, it is proved by continuation of the same Story : I Because God gave Adam free-will to eate of every tree of the garden (the forefaid tree excepted:) besides he left all the bealts of the Earth to be named by him, which cannot be meant of imaginaty trees and beafts: for this were to make the whole Creation anigmati-Gall. 21" This name is often vsed in holy Scriptures elfe-whereas in Execb. 21.9. Genefis 13.19. which would not have bin so, if the whole story had bin merely Allegoricall, and Paradise an Utopia; fith the Scriptures, specially the historicall part of them, are written in a plaine Itile, fitting the capacity of vulgar auditors. Lastly of this Paradife planted in the East, we may find some footsteps in prophane Poces, as in Homer, Orphens, Linus, Pindarus, Fefical, who often speake of Alcinous garden, and the Elistan fields ; all which derived their first invention from this description of Paradife, recorded by Mojes in Holy Scripture, whereof the Heathen themselves had some ob cure traditions. The second opinion was, that Paradise was the whole Earth, and the Ocean the fountain of these fonce riuer ; which was defended heretofore by the Maniehees , Noviomagus, Vasianus, and Geropius Becanus The reasons which they alleage for their part to proue this affertion, were chiefly theie: 1 Because those things which were in Scripture attibu.cd

buted to Paradife, are generally ascribed to the whole world. as that place of Genesis; Bring forch fruit and multiply, fill the earth and subdue it rule oner enery creature. But this argument may easily be answered : for although the world in generall were created for man, and all men descended from the same originall, to wit, the loynes of Adam; yet this disproueth nothing the particular garden affigned to Adam to dreffe. wherein he lived before his transgression: for if there had beene no other choyce, but that Adams had beene left to the univerfall (as they imagine,) why should Moles fav, the garden was East from Eden: fith the world can not be Eaft or West but in respect of particular places? Also why was the Angel fet after Adams expulsion to barre his re-entrance, if it were not a particular place : for according to their opinion Adam should be driven out of the whole World. Their second reason is, because it seemes impossible that Nilus, Ganges, and Euphraies, by so many portions of the world so farre distant, should issue out of the same fountaine. To this we answer that by common Interpreters of Scriptufe, being ignorant of Geographie, Pifon was fallely taken for Ganges & Gibon for Nilus: Although it can no way be true that Ganges shou'd be taken for a river by Handah in India, and Nins should runne through Ath opia, as we shall shew hereafter. The third opinion is, that Paradife is higher then the Moone. or high rat least then the Middle Region of the Aire: this opinion is cast upon Beda and Rabanns; to which also Rupersws feemes to accord: who (as it feenes) borrowed their opinion from Plate, and he from Socrates. But these two (as it feemes) are milinterpreted, because by Paradise they means Heauen it felfe as many imagice: But to confirme that this terrestriall Paradise is such a place, some men produce these Arguments. First that it is reported by Solinus, that there is a place exceeding delightforme and healthforme on the top of Mount Ather, called Acrothenes, which being feated about clouds, or raine, or fuch inconveniences, the people by reason of heir long lives are called Manyi Bos. Secondly they alleage for the hight of this Paradife, that Exoch was there preferred

from the violence of the flood, as Isidore and Peter Lombard finaintaine: But this opinion was of the Divines condemned in the Florentine councell: and first where as they say, that such a pleasant place is in the top of the mountaine Athor; this neither proues that this is Paradile, neither is it so high as they would have it: For every high and pleafant place is not Pa 2dife. Secondly, whereas they would have Exach and Elias preferued in the place, it is expressely against Holy Scripture, which affirmes directly that the waters ouer-flowed all the mountaines, making no fuch distinction. Secondly, should we credite this, we might as well belieue that certain Giants faued themselues in that high place, as some haue belieued. Befides the answer of their frivolous arguments, these reasons may be brought against their affertion: First, that such a place cannot be commodious to line in for being fo neare the moon, it had also bin too neare the fun. Secondly, because in this fort it had bin too neare a neighbour to the Element of fire. Thirdly, because (as many hold) the Aire in that Region by the motion of the heavens is carried about fo violently, as nothing there can well confift. Fourthly, because according to Ptolomy, the place between the Earth and the Moone is scuenteene times the Diameter of the Earth, which make by a groffe accompt about 120000 miles. Hence it must needs follow that Paradife being lifted vp to this great hight, must have the compasse of the whole Earth for a basis or foundation. But this cannot be imagined: first, because it would be subject to the eyes and knowledge of men. Secondly, it would hide the light of the Sunne for the first part of the day being on the East fide. Thirdly it would ouer-poize the Earth, and so make it to thrinke out of his place; one fide being farre greater and heavier then the other. The fourth conceit is of Tertullian, Bonaventure, and Durandus, who would have Paradife to be feated under the Equatour, because that contrary to the opinion of most of all the Ancients, they thought this place to be most pleasant and commodious for habitation. It is true that the places voder the Equinoctial are not fo burnt with the Sunne, as some thought : but, as we have proued out

of later Navigatours; very pleasant and fruitfull for the most part: yet cannot this be the place of Paradife; foralmuch as the Rivers of Paradife mentioned in holy Scripeuse, are not found to meet there: which argument might alfo confute them which thought it was feated under the North-pole. The laft ~ pinion which I hold the trueft, is of some later Writers, that Paradile was leated in a Region South-cast from Welepotamia, which is most amply and copiously proved by S. Walter Rawleigh, to whom I reterre my Reader: onely two reasons I will alleage. The first from the name of Eden , fith there is found an Iland of this name North-west from the place affigned, very fruitful and pleafant in all commodities of the earth, and in later times knowne also by the name of Eden, which is likely to have bin continued from the beginning. Secondly from the Rivers of Paradife, which cannot be imagined to meet in any part of the world: for Tigris and Euphrates it is certaine that they are found in this very Region: for the other River Gibon , that it is falfely understood of a River running through Athopiais also most certains; for such a River could never meet with Exphrates, which is out of question one of the Rivers of Paradife: foralmuch as it is fo far diftant & divided from it by the Mediterranean Sea; wherefore I am constrained rather to embrace their opinion which interpret Chusto be a part of Arabia, where Chush the father of Neah fettled his first habitation; which for this caufe he called after his own name: but afterward in processe of time his postericy growing exceeding large and populous, they were enforced to passe ouer into Africa, and so settle themselves in Athiopia, which place also thay called after the lame name : as we have seene of later yeares the Spaniards at the first discovery of the West Indies called one place Hispaniola, and another Hi-If mia Nova in remembrance of their former habitation. But howfoeuer it be, certain it is, that Paradife was feated in the East, from whence mankind had it's first off-foring And probable it is that Adams being excluded out of Paradife, was cast into some place neare adjoyning therevato, which may also from our habitable place of the West, be accounted Eastward. 3 1 be 3 The first plantation of Inhabitant's immediatly after the Deluge begunne in the east.

As Adam the father of all Nations before the flood began his offpring in the East, neere Paradise, so the second father of Nations Noah in the East first beganne to repeople the world, after the deluge: Which befides the clearer testimony of holy Scripeure, may fundry waies be demonstrated: First, because it is most certaine, that the Earth beganne first to be peopled, neere the place where the Ark refled, which is the mountaine Ararat. Whether this be a mountaine of Armenia as the comon Interpreters imagine, or the mountain Caucafies betwirt Seythia & Indea, as some later Writers with greater probabilities have gueffed, hath fuffred a great dispute; all agree in this that it was Eastward. I will not be here over curicus, but refer it to our historicall part, where we shall particularly handle the memorable accidents, of particular places: E. nough it is to proue that the first plantat o after the flood was East ward: 2 no imall probability is drawne from the civiliey, magnificence, and populofity of thefe Easterne nations before others: For it iscertaine that many excellent Arts have flouri-Thed amongstthofe Easterne people, before euer our westerne climat dreamed of fuch matters; Amogst many other matters, Artillery & Printing was in vicamong it the Chinois and East Indies of ancient time, long before this invention was known to vs; as the Forengalls who have travailed thither hade confirmed. To the vie of gumes and ordinance, many soppole Philostratus to have allused, speaking in the life of Apollonins Tranam lil: 1. cap: 14. Where he faith that the people dwel-Ing between Hyphasis and Ganges vie not to goe farre to warre, but drive away their ene nies with thun le and hohening ent downe from Inpiter By which meanes it is faid that Hercules and Bacchus loyning their forces were there defeated, and that Hercules there caft away his golden flield. For the other Invention of letters how ocher it were by the Grecams afcribed to Cadmu, as the first Liventor, because he was the man that first discovered it to the Gracians; it is most

certaine that it was as ancient as Seth; And that Printing first came to vs, from this Easterne part, appeares by John Guttem. berg, who brought it first out of the Easterne world: Which art Comradus being instructed in, brought the practise thereof to Rome, which afterward one Gefnerus a French-man much bettered and perfected: For howfoeuer amongst the Enropans this invention feemed but newly borne, yet the Chinois had it before other the Egyptians or Phanicians : When the Gracians had neither knowledg nor civility: which is witneffed abone a hundred yeares gone by the Spaniards and Portugalis. Farther for the magnificence of those nations, an argument may be drawne from the Historie of Alexander the great, who found more stately buildings and Cities in the litle kingdome of Porm which lay fide by fide against the East Indies, then in all his former trauailes: for in Alexanders time learning & civility were not spread so farre well as Rome: Neither did he esteeme of Italy any otherwise, then of a barbarous and uncivil place: which made him to turne his army rather against Babilon and the east, which seemed a farre worthier prize: Morcouer, Paulus Venetus shewes, that letters and discipline was first borrowed from the easterne people, without any returne of interest. A third reason may be from the extraordinarie strength of those easterns people in most ancient times. For it's reported by Diedorns Siculus out of Clefias that Semiramis the wife of Ninus, not many discents from Neah, brought an army to invade India, of three millions, befides horfes and waggoners: Neither had Staurobates her adversary smaller multitudes to encounter her: which extraordinary strength and multitude of men could not possibly iffue out of any Colony, fent thither from the westerne parcs: And therefore it must needs follow, that they had their first offpring and originall in those easterne parts neere India. Sundrie other reasons might bee alleaged, but these I suppole will suffice to fortifie this affertion. Then it is manifeft that the first Plantation of nations begunne in the easterne parts of the Earth: But where we shall place and define this Easterne part, seemes a matter of greater difficulty then the o-

ther. S' Walter Rawleigh out of the premiled arguments. would feeme to proue, that this first plantation was far east as farre as India, neere which, he would have the Arke to rest, to wit, on the mountaine Cancasns lying betwixt India & Scythia: Notwithstanding the authority of the learned Author, I find that the most ancient writers have drawne the o. riginal of all nations foone after the flood, from the Caldans, or at least amongst all, made them the first: For confirmation of which opinion, they vrge many ftrong arguments. In the first place, they vrge the testimonie of Moses in the 11 of Geness, where speaking of the first assembly of people after the flood he relates, that they came from the East into the plains of Shinaar, in which place flood Babilon the chiefe leat of the Caldaans, To this they adde the tellimonie of Metalthenes, Herodotus, Ctefias, & Xenophon: which have afterwards bin seconded by Diogenes Laertins, Philo, Porphyry in a certaine epiftle to Boethus, Clemens Alexandrinus in Stromatis: Enfebins de Enangelica demonstratione. Theodoreus lit: 1. de Gracarum affeitionum curatione, Rabbi Moyles Maymonis filius lib: 3. cap, 30 Perplexorum: with almost all the Interpreters of the Hebrewes: All which with vniforme confent have affirmed that Civily, Arts & feiences, derived their first descent from the Caldanns. Hence they faigne that Promethens being a Caldean, for that he recal'ed men from a wilde life to a more civill conversation, and taught the regular motion of the Barrs and planets before vinknowne, stole fire from heaven, and animated men formed out of clay, with a caleftsall foule. But aboue all which may be collected in this kind, no small argument may be drawne from the markes and footestoppes of the Hebrewe and Chaldy tongues, which in no mixture of tongues, or processe of time could ever be abolished: For this, being the first of all other languages, was preserved by Abrabam and his potterity; And challengeth antiquity before euer the Latmor Gracian tongues had any memory: in somuch as all the ancient nations of the world are found in most of their originall names of Gods, peoples, Princes, and places, to make vie of the Hebrew or Chaldey tongues, differing onely

indialect, which without manifest wresting and absurdity. cannot well be derived from other later languages. The first father of the people of Enrope was Tapher the fonne of Noah, according to the loyar confent of Hebrewes, Gracians, and Latines: To which alludes the Poet, where he faies, Andar Lapeti geniu. This name non or laphet in Hebrew fignifieth stinuch as Dilararion or enlargement ! Whereas the Greeke Etymologists ridiculeusly draw it from many other origimills: In the like fort Tanens ignorant of the Hebrew, would have the people of Palaffine to be called Indei quali Idei, from the mountaine Ide in Creete, from which he dreames they were derived; whereas the word in the Chaldy fignifies, as much as Prayfers. In like manner low or (according to Hemer) I am, supposed the first Author of the Iones, would the Graciane deriue from a flower, whereas the word in Hebrew fignifies almuth as a decement Whence Daniel prophecied of Alexander the great, that the King of 177 that is laan or Javan shou'd raigne in Affria, Instances in this kind are infinite, as of Danans, drawne from 77 Dan which fignifics a judge whence comes Dardanus which is the feat of Judges: Of langs from 177 lages figuifying wine, in which fente he is by Halicarniffens called Venetrins: Of Actien which fignifies Greece, Leppe which is fireight or narrow, Nimrode Rebelievs. Ninus a fonne, Ninine the house of Ninus, Solon quaf Solam a peace maker. So Cadmus supposed to be the father of letters & learning, amongst the Gracians, fign fies in the originall, so much as an Easterne man or an ancient man. Should we runne any further on this point, we should be thought to write a dictionary, for as much as all the ancient names amongst the Gracians spring from the same fountaine: Whence that Ægyptian Prieft had good reason to obiect to Solon: That the Gracians seemed children, because they had nothing ancient amongst them: But to bester purpole a Christian obiected to the Gracians that Morfes the Lawgiuer to the Christians was ancienter then all the Gracian Gods; Other reasons are taken from the Religion of the Hebrewes, out of which feeme to be deriued all the famous religious

religions of the Earth: For to let passe the Christian, Jewish, & Mahometan Religious at thisday flourishing, all of them challenging great antiquity, and taking a great mixture from the trueff and ancience thebrew discipline: It is manifelt that in the Heathern'h superflicions themf lues, many footesteres hour bin discouered; which will appeare by duers Initances. Thele arguments I confesse seeme very it ong, but yet not of fufficient il: ength to enforce credulity without other warrant: To fay peremptorily with A. Bedin, that by the confent of ancient writers, the Caldeans are acknowled the most ancient people is more thead dare to venter: Neither is this opinion to itroughy fortified with arguments, but Region may fleppe in to have a doubt a lastault. Their first argument drawne from the tellim my of holy Scriptures in the 11 of Genefis, feemes to Itand on our fid , al ogether against them: For whereas it is fild, that they came from the cast into the plane of Shingar it is manifell that the enfl was first peopled: or elie how should this people come from the cast into these plaines of Skinaar, to erect the tower of Babel? Secondly. whereas they vige Arts, Civility, Magn ficence of the Caldeans, we shall find it rather to agree to the people which dwel farther east, as is wirnefled by the former instances. And if any object that at this day is found the contrary, for as much as we find the Indian to be a barbarous blind and ignorant Nation, in report of the Afranches and Europe ins, we answere two waves. I First, that we and not by expenence the East-Indians to be lo alte gether de oide of civility, but that we may ob crue not only among it them the foo effens. but also the practise of many ingenuous A ts, sage goverament, policy, and magnificence, as among it the Chin is & the large territory of the great Mould 2. It is not hard to imagine that in fo lage a tract of time, the belt to led conmon wealthes should be beaught to nought, airs, outley. magnificence, be forgotten, and the rarest louent me be cath into oblinion, especially by those two energies of emity. warres & luxury both which having the aiguas inth arown hands, are quickly able to abolish all wholesome discipline, Ec " both

both in Lawes and Religion. 3 Their Argument drawne from the footsteppes of Languages in my shallow conceit, proues nothing els but that civill Lawes, Arts, and Learning was derived to the Gracians from the Caldeans, or the Nations neare adjoyning, which formerly received it from them But how farre Learning might propagate it felfe the other way towards the East, is not a matter so cleare and out of question. The preservation of the Language (for ough: I fee) might grow from the continuance of the Rel gion, more firmely rooted, and for a long time continued in Alraham's posterity, whose abode was settled thereabout, whereas the other farre divorced, as well from their first spring, as the monumentall seales of their Religion, quickly turned Religion into Pagan Idolarry: Many reasons besides the disprouing of this former opinion may be alleaged to proue the Ensterne part of the world to have bin first peopled: amongst which I will only cull out this one, grounded on the text of holy Scripture. It is warranted out of the text: I That when the waters began to decrease upon the face of the earth, and the Arkebegan to rest vpon the mountaine Ararat, Noah sent out a done to make tryall, who returned with an oliue branch in her mouth. 2 That neare the place he iffued out of the Arke with all his fam ly, he planted a vineyard, and was drunke with the juyce of the Grace, not knowing the strength thereof: out of which by all probable conjecture must medes be collected, that the Regions neare the place where the Arke first rested, by the benefit of Nature afforded both Vines and Olives : for we cannot imagine the fily Done at the time of the flood empty gorged to have flowne very farre over the face of the swaters to obtaine this Olive branch, nor Noah after the flood. to have gone very farre to feeke out a convenient place for his Vineyard: whence it is most likely that the Arke rested in fuch a place, whose neare adjoining Regions are inriched with fuch commodities. Butthis cannot be verified of Armenia, wherein for ought my reading informes me, are found neither Vines, nor Oliues, whereas some places Eastward, wheron the Arke according to this other opinion was supposed to reft.

rest, afford both in great plenty. To empire betwirt these two opinions, I leave to my friendly Readers; because it is not in our power to command, but obey Reason.

CHAP. XIIII.

F the original of Inhabitants of the Earth we have spoken: Itremaines wee now treate of their

naturall Disposition.

There is nothing more subject to admiration, then the diversity of naturall Dispositions in Nations; a matter evident to the eye of observation, and needing no proofe or demonfiration; for who observes not in all Nations certaine naturall or nationall vertues or vices, which neither time nor Lawes could euer change or correct. For not to roue fart her off then our neighbouring Nations Confines; what Writer in this kind almost, were he not very partiall, hath not taxed pride and ambition in the Spaniard; levity, or rather (as Bodin would have it) temerity in the Fren b; dangerous diffimulation in the Italian; Drunkennesse in the Dutch : Falshood in the Irifb; and gluttony in the English? An how socuer many means have bin put in practife, either by the feuerity of lawes to curb fuch enormities, or the fubrilty of discourse to shroud these vices under the name of vertues: yet these markes are found to flick as clote as the spots visto the Leopard, as neither altering their pristine hue, or yeelding to ime or statutes: And if it happened at any time that by extraordinary violence fome litle alteration were wrought, yet fome few yeares would find it returne againe vnto his own nature and diffofitton. This variety of dispositions being very many, and depending on fundry caules, to helpe memory, we will reduce into certaine heads, out of which in the generall we may give a judg. Ec * 2

a judgment, leaving the rest to our specials. The name of naturals disposition in this place we take in the largest sense, fo farre forth as it comprehends under it the Complexion, Manners, Actions, Languages, Lawes, Religion, and Government. All which to farre forth as they depend from the places we will show. Neither intend we to handle nicely all these specialties, for a smuch as the Manners, Customes, Lawes, (and for a great part) the external sites of Religion depend on the natural constitution of the Inhabitants: so that little can be a spoken of the natural constitution, but of such actions, effects and markes as show themselves in their ordinary customes & manners. Wherefore we shall be constrained to treat of them together, the one being a great furtherance to the explanation of the other.

The natural disposition of the Inhabitants of the Earth may suffer change and diversity, either in respect of the site, or in respect of the quality of the soile, or in regard of the Inhabitants themselves.

7 The fite is the respect which one place in position beareth to another: Here a Nation is divided into, 1 The Northerne or Southerne, 2 The Easterne or Westerne.

4 The Northerne is placed in the North Hemispheare, betwirt the Equatour and the Actick Pole The Southerne on the opposite side betwirt the Equatour and the Antarticke Pole.

Of the Northerne and Southerne inhabitants we speake not here respectively, as in regard of the same Hemispheare, but absolutely in regard of the two Hemispheares and their Inhabitants. How these 2 Hemischeares of North and South are varied in respect of the quantity and disposition of the scale deciphed before. What diversity shall be before inhabitants shall essential in this Theoreme.

The peo; le of the Northerne Hemispheare as well in riches and magnificence, as valour, science, and civill government farre surpasse the people of the South Hemispheare.

The people of the Northerne Hemispheare we understand to be the Europeans, the Afratickes, the hithermost Africans being the greater part the Inhabitants of America Mexicana, with the lathermost part of America Peruana together with the people inhabiting the viknowne land, lying vinder the Artick pole, with all the Hands belonging to each of their: The people of the Southerne hemi-fpheare containe a moity Southward of the Africans, the inhabitants of America Perisand for the most part: the people of the Terra Australis incognita or the fouth Indies, with some Hands belonging therevnto. Betwixt thefe two partitions, if we make a comparison, we shall find a greater disparity then ever any invention of man could any waies reduce to any shadow of Æquality or any Travailers observation could ever steppq in to diminish. To begin with the ricles: It is certaine, that the encrease of it in any nation proceeds, either from the benefit of the foile or from the skill and diligence of the inhabitants . The benefic of the foile either in respect of the quantity of the ground, or the quality of the foile in this foutherne part, we have at large proved to befarre inf rourto that of the Northerne hemitpheare. The di igence of the people we can measure no otherwife then by their Traffick with forraigne nations, or their good husbandrie of their owne commodities. Their traffick with forrainenations, is suspected to be litle or nothing at all, in respect of the northerne Inhabitants having finall commerce or knowledge of forreigne nations, and that rather enforced by violence and conquetts, then any way defired of Ec. 3 themas

them; Whereas scarce can be found any nation of the Earth, which cannot by commerce or traffick with forraigne Countries, at le: It neighbouring confines both strengthen theselues. & draw riches from other nations: Lessecan be hoped from their homebred industrie, which is content with sufficiency. neuer aiming at tarther riches then naturall necessity feemes to exact, as may appeare by all records and Histories almost which have treated of this matter. If we confider the fate & magnificence of either, we shall acknowledge a great difference, as didaining all comparison. The first offering of all nations owes it felfe (as we have proved) to our Nortl ernehemispeare, which that Almighty Creatour of all things blesfed with knowledge and civill gouernment, before cuer this Southerne coast was knowne or mentioned. All the acts of the old and now Tellament performed on this fide of the Equatour, can speake the state and magnificence of these natitions, leaving the other as yet neglected without memorie or Hittorie. Neither hath the Christian religion, the true ground of all f. t ed gouernment euer bin fo propitious, as to imile on these miserable Nations, asyet groaning under the seruile bonds of groffe Ignorance and Pagan superstition. Where shall we find in any records or antiquities, any state amongst them to parellell the foure greater Monarchies of the Allyrians, Medes, and Persians, Gracians, and Romans, or the later rifen vp out of their ashes, whereof this one age can produce no few examples? What place is extant at this day in Europe, Afia, the Northerne tract of Africk or Americal some few Deferts onely exepted) which have not bin either by knowledge received from forraigne Nations, or some other meanes in some fort reduced to civility? At least to have embrased some settled forme of government: Whereas the Regions daily discouered in the Southerne moity are found most barbarous, without lawes, sciences, or civility. Or if any fuch perfection flew it felte among it them, it is manifelt that it is owed altogether, to the industrie of the Europzans, who with great cost and travaile, have brought them such riches whereof the poore wretches neuer knew the want. Insteed of fa

fo many Colonies fent out of Europe & Afia into thefe Southerne Regions, no record I suppose can mention one curr sent from them vnto vs. Which is an argument of their ignorance and want of traffick. What shall I speake of the valour and prowelle of the Northerne inhabitants, having by the fword erected so many kingdomes, and (as it were without resistance brought into captivitie those Nations of the South? of Arts and Sciences what can be faid, but that the Northerne Inhabitant hath all, and the other in a manner none: For liberall and ingenious sciences our Schooles and Vniuersities disperfed in most parts of Europe and else-where can speake our glorie: Which for ought I could ever learne the Southerne Continent, neuer faw; an andmit they know fome thing in fome Mechanical arts, it is no more then necessity requires. Neither in the number and exter t of Invention, or curioufnes of workmanship answearable to that we find at home. The artes of Printing & Artilery were I suppose neuer of their acquaintance, except perhaps the later, which I dare fwe me hath thad better acquaintance then welcome; as that which never Thewed it feife but to their ruine: No objection can beere take place in this comparison, except some man suppose the monuments and Trophies of these nations, either being very ancient have miscarried by time, or else being of a newer birth are hid, wanting the light of discoverie: But this is am ere conjecture wanting ground: For what Antiquity or record could ever flew fo much, as the footesteps or marckes of any fuch monuments? as for the countries as yet vndifcouered, no better conjecturall judgement can be given then by that which is already found: For where all other reason and obsernation is filent, I alwaies hold acquality the best measure: Another argument not inferiour to the reit, is the antiquity of the Northerne nations, which without all question is farre greater then that of the Southerne: Because we cannot imagine any man fo adventurous to passe into these re note quarters, till fuch times as the places neerer adioyning, growing too populous, conftrained then to feeke out a new habitation; which no man could conceive to be but in many yeares after

after the vniuerfall Deluge.

5 Each Hemispheare with the inhabitants therein contained, may againe he divided according to the Longitude or Latitud: according to the Latitude, inhabitants may be called either the Extreame or Middle.

6 The Extreame inhabitants are either the Northerne or Southerne. The former in the hither Hemispheare. The other are the inhabitants thereunto opposite in the other Hemispheare.

7 The middle Inhabitants are such as are situate in the middle betwixt the Equatour and the Pole in either Hemispheare.

The mistaking of the true limits of North and South in this our Northerne Hemispheare, hath caused great errougamongfitche Ancients : Infomuch as Hopecrates premounced the people of the North to be of a leanest dividition in ion, of a finall and dwarfill (tarme; whereas other Whiers out of a good observation base found them to be of a tall thanke, lagbone 1, & of a most state confliction in releast at those of the South. To compose which difference we must have recorne to that the priming of the Hendeless excluse a centeral. wherein weathered at the so depores care past inshirthe Angelmen with Pole, and other to harvel to so to the for more. Where the former brick bout word to the Fresh. been The property and the service and the first the Property of the services o as the low the derivative having that break do we had a fire Market BEAUTER THE COMPANY OF SPECIFICATE TO PROSERVE TO THE TRANSPORT and the long to that the later constraints and the second as that there exists a relative flower to be any amount or an ex-

then. Nature be squared to our owne conceits; yet shall wee shew in a generality, and for the most part, that the naturall disposition of the Inhabitants, ought to be judged and measured according to these limits: though not exactly answering in precise degrees. Wherefore towards the North we limit these (with Bodin and other good Writers) which ly from the soth degree Northward to the 70th; in which Tract we shall find our Brittaines, Ireland, Denno irke, Gotland, the lower Germany from Manus & Hipanus to Seythia & Tartary, which take vp a great part of Europe & Afa: on the South we place the most Southerly Spaniards, the Sicilians, Peleponnesiums, Cretians, Syrians, Arabians, Persians, Susians, Gedrosians, Indians, Agyptians, Cyranians, Carthaginians, Numidians, Lybians, Moores, and the Inhabitants of Florida in America. The middle Region is meant that which lyes iust in the middle place betwixt the Tropick and the Pole; not that which lyes betwixt the Pole and the Line : the reason whereof we have shewed before; because the places under the Tropicks are found to be hottell, but under the Line more temperate; fo that our temperate Clime here we place that which beginnes at the 40, and endeth at the 50 degree of latitude: In which Climat by the No: thernmost Spaine, France, Italy, the higher Germany (as farre as the Mafe) both Hungaries, layria, both Alyfins, Dacia, Moldavia, Macedon, Thrace, and the better part of Asia the leffer, Armenia, Parthia, Sogdiana, and a great part of the greater Afia: to that all the Nations as yet mentioned in histories, and perfectly discouered in our Nor herne Henniplesie are contained betwixt the 30 degreepot Litisude and the 60. What to thinke of the Nations dwelling betwixt the two Tropicks, and those which are 60 degrees to the Pole, for want of accurate observation and History we can fet downe no certainty; yet fo farre as men may indue by corsecture we may accompress the Regio between the Trop ofer, the re degrees from the Tropicke to wards the Lie, to be of like our ity walt the equipper without the Improve. The Track in the mobile water the . 4 sw ther, being more tempes race, then that of the Zeepicky, may be infeed to come money

the temper of the middle Region between the Tropick and the Line, though perhaps formewhat hotter. For the Regions very neare the Poles, lefte certainty can be collected: yet that late which we find concerning the nature of these Inhabitants we will not omit. According to this partition of our Northerne Hemispheare, we may make judgment of the other; because where no other cause shows it lest, we may well guesse these places which are of equal fite to be of aquall disposition, so faire forth as they respect the headenly operation. All which concerns the natural disposition of the Inhabitants, we will reduce to these three heads; to wit either a the bodily qualities; a the mentall Affections, a the outward Actions.

The Extreame Inhabitants toward either Pole, are in complexion Hot and Moist: Those toward the Aquatour Cold and Dry: those of the middle indifferent as

partaking of both.

The confirmation of this proposition denends on 2 points: the first is the Declaration of the Canfe of this Diversity : the fecond is the effelts and diverfe tokens which this variety of temper produces, as well in the Accidents of the Body, as the Mind. The cause we have partly before opened, which is the Heat of the Sunne in Climates nearer the Aguatour, and the Cold in places farther remote, and fituate nearer the Pole: whereof the former, working on the Internall heat and moiflure of men and all other living creatures living in those hot Climats, drawes it out, and confumes it in fuch fort, that litle remaines but cold and dry melanchely, as the Seas in the bottome, the other parts being (as it were) evaporated : For by how much more beat any man receives outwardly from the heat of the Sunne, so much more wants he the same inward'y; which every man may fee confirmed out of ordinary experience; fince that our naturall heat is far more vigorous in winter then in summer, and that our joints are more operative in froj'y weather, and then when the Northwinde is flirring. On the

the other fide in the summer we commonly observe the e ntrary we fin tour joints lazy and heavy, our adpended dull. os may allo be perceived in the English Germans, and Freich. trausing from the North Southerly into Italy and Sparer, who if they co fine not their diec to a sparing race, they commonly are furprized by furfers: an example we have or Philo Duke of Antria, living in Spaine after his German fall on. But on the contrary it a Spannerd, who in his own Country is inured to great Niggardhuelle, arrive in our Northerne Countrey, he commonly prouss a better trenc er-man then our natime Inhabitants. And this Bodin observes to fall out true, not only in men, but also in heafts, which driven towards the North wave far, and proue well; but towards the South they pine away and waxe leane: which may well be confirmed out of Leo Afer, who averres, that almost throughout all Africk you shall find few or no heards of cattle or horse; few sheeps, and scarce any milke: whereas each mans Table almost in Germany and Britainsy can give a plaine demonstration of our Countryes ftore in this kind. Hence may appeare that as the beat of the Sun towards the Equatour, by drawing out the internall beat und monsture caufeth men inwardly to be left cold and dry; fo towards the Pole the internal moift are being preferred from the Excesse of Externall heate, and the internall hear being strengthard and thickned by externall cold. have left vnto them a complexion of beat and moisture. The middle Region betwixt both extreames being compounded of both, must needes by mixture and participation injoy a middle quality. Besides this exposition of the causes of this temper we shall observe many speciall markes and Instances which will discouer this variety of disposition. First, it is plain that heat and mossture are the two qualities of tecundity. Whence it must consequently follow, those Regions which are most populous to be chiefly endowed with this quality and disposition. Now where shall we of this Hemi-Spheare find any Country to whom Nature owes a greater increase of mankinde, but in the North amongst the Gothes, the Seythians, the Standians, and Germans, by whole abundane

dant fertility , vast desarts haue bin cultured and inhabited, Hately Cities have bin founded, Colonies have bin transported and derived almost into all Europe? Hence have Metha dies, and P. Diaconus compared the armies of the North to Swarmes of Bres; and the North is termed by Olam Mannu, the store-house of mankinds to wit, from which so many firong Nations, as the Gothes, the Gepida, the Hunnes, the Cymbrians, the Lumbards, the Alani, the Eurquidians, the Normans, the Picts, the Hernli, the Suevians, the Slavi, the Smitzers and the Russians are not ashamed to derive their Ancestry. But here may be objected that the Son: herne people are much more addicted to Venerie then the Northerne, which feemes an argument of greater Heat. But to this I answer, that this infatiate appetite of Venery in the Southerne people, proceeds not fi o hear but fro Choler Adult & Melancholy: which humours carry in them a falt & harpe quality (according to Physicians) which stirres vp their appetite to Venery : which we may plainly observe by experience: for no men are more moued by this itching appetite of carnall Copulation, then Melane aly men. But how locuer, this affection is meft predominant in such mee, yet it is hardly seconded by performance: which makes Geographers to aferibe more propries of genes ration to the Northernemen, although fenfuall concupifcence raigne more in the Southerne men; which indifferent proportion was without doubt granted to either, by the prouidence of Almighty Gad, that they who were endowed with a greater tufficiency, should leffe affect fenfualt delights then the rest, which want that proportion of heate and moss ure; And those of the other fort should have their Appetites more raised up to wantennesse, without the which their off-spring would foone faile. A second argument to proue our affertion is the Tall and large flature of the Northerne-man, which are gues both heat and moifture; where as the Southerne man is finall and dwarfish in stature, composed of weake and feeble Nerues. That the people fituate towards the Pole in a mode. rate distance, surpasse in greatnesse, can be showne not only in this our Hemispheare in the Germans, Scothans, Belgians,

and others; but also in the other by the Pantagones. whole fituation Southward answeres somewhat neerely to the hight of Germany. That mo fture is a great cause of growth, appeares as well by Trees and other vegetalls, which growing in low and marish grounds increase to a most incredible greatnes; as of those fore-mentioned on the fide of Rivo Negroin Porm and neere the Lake Hiarotis in India as by Beafts. For first we find the moistest to be of greatest stature, which is the reason why the great Whales and fishes in the sea grow to such a vast quantity. Secondly such Beafts as have hot & moift bodies cannot fo well profper and live in those Southerne countries; as the horfe which by nature being hot and moist, liueth but faintly in Athiopia, yet is of good firength in Scribia; Whereas the Affe being by nature hot and dry is of great accompt and service in Africk, in Europe litle respected, in Soythia cannot live. Neither is moilture fufficient for the growth except it be flirred vp by hear : wherefore we may conclude hence that the Northerne man hath both: Out of the contrary effects, we may likewife collect, that the Southerne man wants this quality. These reasons indifferently proue thefequalities to wir, of hear and moilture, to belis the Northerne man, and the contrary in the Southerne. Diverse other arguments are viged, some to proue the one qualay, fome the other apart. A great argument of heat in the Northerne man may be his extraordinary drinking: A vile which could never be reformed or corrected by times in thatates. This drowth of theirs fliring vp this defire of drinking, can proceed from no other cause then their hear: Wheras the Southerne man is seldome taxed of this vices not because he is more religiously comperat then the Northerne; but rather for the naturall temper of his body, which can neither require or beare fomuch as the Northerne. In tomuch as Bodin seemes to make adoubt, whether the immoderat orinking of the Germans is to be efteemed a greater fault. then the niggardly sparing humour of the Italian: bith both arife rather out of nature then education: Another argument of heat in the Northerne man, is the extraordinary firength. FE* 3.

in respect of the Southerne man, which is an apparant demonthration of heat. We find that the bloud of the Scattian is full of fmill ftrings fuch as are in the gore of Bulls and Bores, and betokeneth strength: Whereas the bloud of the African is thinne, fuch as is in a Hart or Hare. No leffe are those reasons which especially proue the Northerne man to be endowed with much moisture. Thirdly we may much better argue from the Physiognomical accidents of the body-we shall and the inhabitants under the Tropickes to be exceeding black: under the Pole it felfe beyond 60 degrees formewhat browne, but from thence about 60 their colour is reddifh: from thence to 45 degrees whitish: about the 10 they begin to wax yellow; and then fomewhat enclining to greene: all which proceeds cut of the variety of heat and cold For the Blacknesse of the Africans about the Tropickes, we can ascribe to no other certaine cause, then externall heat, and i ternall cold his necessary concomitant: neere to which approcheth the yellow and greene colou of the people not farre of: Whereof the former discouers Choller and Adultion the other melanchely. And how foeuer the brownnesse of the people dwelling very neere the Pole may come by reason of external cold which by excesse, rather dries vp their moisture, then frengthens the internall heat: Yet the Redcolour of the Inhabitants about 60 degrees is a firme argument of heat; and the white hue of the middle people, an apparant marke of a middie temper. No leffe may be collected from the eyes and haires of these three Nations. The eyes of the Scythians are generally tending to a gray colour; The remote have them of a blema whilish shining colour; as the Cymbrians and Danes according to Plutarch; The Britannes, Germans, and Normans come neere vato this colour, but have them not altogether fo gray and faining but more obscure. But the Southerne man hath the colour of his eyes much enclining to black. Now if we will beleeue Aristotle in his Problemes, the gray colour of the eyes is a very great argument of hear; But the black in colour argues the want of hear; Those which dwell in the middle Regions, have for the most part their eyes of a darke-blew, which colour

colour is apparant in the eyes of Goates, which as Pliny writes are neuer purblind or dim of fight. Many special arguments befides those before mentioned, are produced to thew the Northerne man to surpasse in moisture as the other in drouth: The first may be taken fro theirvoice, which in the Serthian, of Northerne man is tending to hoarfenes; but in the Africans very tharp & thrill, the Ethiopians, & Carthaginians, and the most foutherly as in Spansards. That this difference doth arife fro the moisture of the one, & the want of it in the other may as easily be perswaded; because we observe women which are moister then men, to have tharp & thriller voices: Alfo that too much moisture in wood or metrall makes the found of it very hoarse and harsh; as we see in lead, whereas other mettalls give a shriller found: Another reason is drawne from their extraordinary sweating; for it is observed, that Northerne men trauavling towards the South, or warring in hotter Countries. are like of faint and perish through extraordinary sweating; as Plutarch in the life of Marin, records of the moith bod es of the Cimbrians. Thirdly it might seeme wounderfu!! which Tacitus relates of the German nation, that they love floth and yet hate rest; because (as in Children) the naturall heat provokes them to Action, but the moiffure procures Softneffer whence they must either fight or fliepe. Hence the Italians & Spaniards make accompt, if they can suffer or wishstand the first or secondassault of the French or Germans, easily to vanouish them; because as Marin and Casar observed of the French, that in the first affault they shewed themselves more then men, in the fecond leffe then momen. A fourth reason not inferiour to the reft may be drawne from the foft bodies, of the Germans and Scythians, not any way patient of lal air, hunger, and thirft, although very ftrong and able to give a fuddaine encounter or venter on a warlike exploite: The contrary in all shall we find in the Southerne man; out of which we may well collect; thathe enjoyes a contrary temper: Befides. all which we have laid concerning this affertion more shall apgeare heareafter by thefe subsequent Theoremes ...

2 The extreame Inhabitants towards the Poles are more naturally inclined to Mechanicall workes and Martiall endeauours: the Extreame towards the Æquatour to workes of Religion and Contemplation: the middle to lawes and civility.

There are found 3 kinds of discipline, which viually invade and occupy the mind and faculties of man: The first are mechanicall and externall operations, the which are projected in the Intellectual part, yet receive their perfection from the bands and externall organs; Such as are Artillery, making of ordnance: casting of mettalls, and chymicall inuentions, Printing and the like arts. The second is Contemplation, separate & removed from externall operation. The third as the meane betwixt both, is civill and morall discipline, whose act and perfection confifts, in the making of Lawes, establishing and governing of flates, prescribing and maintaining of dinine worship, with other matters of the like nature. These gifts it pleased God so to distribute to mankinde, that the former should be most appropriate to the Northerne man; the second to the Southerne, the third to the inhabitants of the middle region: in fuch wife as the one should need and not enuy the others perfection. All which we shall demonstrate first out of the canfes and ground; Secondly, out of the effects. The causes we have shewed in the former Theoreme, wherein we have afcribed to the Northerne man abundance of heat and moifture in respect of the other; which are the chaifest aides of the imagination, on which mechanicall faculties depend; also their plenty of bloud and humours distempening their minds, they are, by this meanes leffe gitten to contemplation. The Southerne men having cold and dry braines are of greatest understanding in Contemplatine matters; being (as it were) by reason of melancholy abstract from externall operation. The middle temper of the braine and humours must need, be

be the mother of a middle discipline, which is found to be that which concernes manners, lawes, and religion. Heere fome have gone about to reduce thele three kinds of people to three planets answerable to these 3 dispositions. Over the Southerne people they fet Saturne: the Northernethey commit to the government of Mars, the middle inhabitants to Inpiter. The power of Saturne according to the Chaldens confits in Contemplation: of Inpiter in practical action, of Mars in Artificia all operation. Which 3 properties may be well garhered out of the Hebrew tongue macures best in erpreter; for Saturne they call Knhy which is as much to fay as quiet; becauf noching better befits the nature of contemplation thente ired quietnesse: Supiter they call 774 which is as much to say as Inft: Which the Gracians houng received from thefe Hetremes, they fained Inpiter to be the God of luftice. Mars they called DATK's which fignifieth firong or puiffant, for which cause the Chaldeans and the Gracians would have Mars the God of warte. To Saturne they afcribe cold, to Mars hear, to Inpiter a temperature betwixt both. To the first, they impute the invention of sciences and such as concerne contemplation; To the second practicall prudence; To the third Ares and workemanship. Whereof the first depends from the understanding, the second from practicall discourse, the last from the operation of the phantasis. But to come neerer the matter and descend to particulars : we will first beginne with the Northerne man whom we shall find to be the father of most mechanicall Inventions as of Gunnes, Printing, the art of hquefaction. Chimiftene with infinite other excellent Arts. Hence it comes to passe that the Italians and Spaniar is, are vied to fend over for Britaines and Germans, as for those which are endowed with a heavenly gift in the Invention of veines of metalls under the Earth, as also for the opening and well ordering of fuch Mines: Let any man call his eyes on England, the Neither-Lands, Germany, he shall find the Inhabicance generally, either as the Scho lers and darlings of Mars weilding their frords, or as Pioners levelling of mountaines, or as Ingmers contriving the course of waters, or hanting in Gg + the

the woods, or plowing in the field, or looking to their flo kes on the mountaines, or working in their shops, or at least fet vpon some externall worke or other; that their wits (as Bodin merily speakes) might seeme to be in their handes. From whence come for the most part our severall sortes of staffes, our choice workes in mood, mettall, Ivory, our variety of infiruments, from the Italian or Spaniard? No truly: they can rather admire then imitate; and better fet vs the materialls then invent the workemanship, like those diffrested Israelites which were enforced to runne vnto the 'Philiftimes to have their swords sharpened. As we ascribe to those nations of the North this perfection in operative and externill faculties; So cannot we deny the Southerne man his due prorogative, which is Religion and contemplation. For these nations being about all other affected with in lancholy, willingly withdraw themselves from common society into Desarts, and remote receptacles, more accommodated to abstracted meditaion: For contemplation (being of the Hebrewes tearmed a precious death) hath a speciall force to sharpen the wits of men, and by separation(as it were) from the dregges of the vulgar, not onely opens vnto him the fecrets of nature, but gives him wings to flie vpto heaven in facred meditation. Whenceit cannot seeme strange that from these parts at first proceeded the Prophets, Philosophers, Mathematicians of great astimation. Also that almost all Religious of any great moment, owe their first originall to those parts: we need roue no further then the H. brewes, Chaldeans, Ezyptians, Gracians, whome we shall find the first founders of dinine and humane sciences. Which hiftoricall observation differes not any what from the judgement of the Naturalists: Because (as Huarim observes) the true foment of the belt understanding, confists in the cold and d'y brain incident to melancholy. And Aristotle obferues, that beafts themselves are somuch the moreadiudged to approch the prudencie of man, by how much they pertake the quality of cold. An instance of which may be given in the Elephant, whose bloud (according to Pliny's Testimony)is coldeft of all other Creatures. To this I might adde for an argument.

gument of the religious disposition of the Southerne man, what Lee Afer writes concerning the vast number of Temples in some places of Africke, as about Felle & Morocco, their thrict observation of holy rites, their rigide Ecclesiasticall cenfure, with fuch like. What is spoken by Alwares of the fall Amara in the middest of Africke, of their strange Library. Churches, Pallaces, with other matters of this purpole, would ferue weil to my purpose, had I the ingenuity to beleeue the Iesuite. But against this may be obiected perchaunce that the Christian religion which is the truest and onely religion hath no great footing as yet among ft those Southernenations. Secondly that their Churches have no perfect platforme of Ecclesiastical government, as we find in other Churches towards the Northerne tract. To the first I answeare: that we heere speake of the Inclination of men to religious exercises, so farre forth as it depends on their naturall disposition, not refpecting this or that religion: for to be informed in the true religion and reject all other, depends not any way on the naturall Inclination of men, but on the immediate guift of the Almighty God, which is pleased oftentimes to make election of one nation before the other, to make the one (according to the Apostle) a vessell of honour, the other of dishonour. To the second I likewife answere, that in Religion 2 things are to be confidered: First the Religious and devoute Inclination of man to embrace divine contemplation: Secondly the well ordering and gouerning of religious actions, according to Lawes and fratutes pertaining to the externall regiment of the Church. The former only being granted to the Southerne man, we may ascribe the perfection of the other to the people of the middle region, whom we have pronounced tobe most happy in the managing of civil affaires and politicke gouernment. Now to proue this people to be best endowed with this facultie, many reasons may be alleaged; because according to the testimonie of most approued writers, we have found lawes, manners, flatutes, and the best manner of gouerning common-wealths to have proceeded from these nations. For Histories will shew vs, that the greatest and best empires G g * 2 of of the world have flourished in Asia, Greece, Agria, Italy, France, Germany, which lie betwixt the Aquatour and the Pole, from the 40 to the 50 degrees: And that out of these have alway proceeded the best commanders, the most prudent states-men and Law givers, the wisest Lawiers, the most eloquent Oratours, the wariest marchants. Whereas neither Africa in the South nor Scythia in the North, could ever boost of many Law-givers or states men worthy note; whence Galen complaines that Scythia never brought forth any Phiosopher besides Anacharsis of any great credit.

3 The People of the Extreame Region towards the Poles in martiall trowessed baue commonly proued stronger then those neare the Equatour: but the middle feople more prouident then either in the establishment and preservation of Commonwealths.

The grounds of this Proposition we have laid before: for the former clause, that the people of the North should proue more puissant then these of the South, may well be concluded out of their naturall strength of body, and their courage of the minde: whereof the latter makes them ready to attempt, the other to execute most chivalrous designes. Neither wantthere most true and pregnant examples in history to second this principle: for enery man that is indifferently feene in history may observe with wonder how the strong Nations of the Scythians have invaded the South, winning from them many Trophies and victories : whereas we feldome find any expedition fet on from the South to the North (except to the loffe or ruine of the South) worth any memorable relation. To this many would have thef: threatning prophecies of Ier. Ezech & Efar to allude, which foretold, that from the North should iffue warres, troopes of hersemen, & the Ruines of Kingdomes: This we shall observe to be true not only in the generall, but almoft

most in all particular States, which we shall find propagated from the North to the South. The Affyrians at first overcame the Chaldeans; the Medes the Affricas; the Persians the Medes, the Greekes the Persians, the Parthians the Greekes. the Romans the Carthaginians, the Gothes the Romans, the Turkes the Arabians, the Tartars the Turkes: and how focuer the Romans by their prowelle wanne somewhat towards the North, yet found they by experience that beyond Danubine no great matter was to be expected; forafmuch as thefe Nations could not be easily vangu shed, and being ouercome would not away with subjection: which (as some say) was the cause that Traian having built a great Bridge of stone ouer the Danow, was perswaded to breake it downe. Tacitus expressely confesseth that the Germans were too hard for the Romans, and could not have bin overcome by them, but by the advantage of the weapons and marner of fight; wherein the Romans having long continued a city I Nation, had prachifed themselues : which he secondeth by many instances, drawne from severall conflicts betwixt the Germans and the Romans, which he might well fpeake : forasmuch as himselfe reports 210 yeares were spent in the conquest of Germany, & no Nation somuch troubled them as this; which not with-Rading when all was past, was thought to be triumphed over rather then coquered. It were an infinit task to write all which Tacitus relates of the valour and warlike disposition of the Germans, being a Nation louing rest, and hating Idienes, punishing cowardice with Death, and reputing it an inexpiable shame for a subiect to see his Prince flaine in Battaile, and returne aliue without him. As much or more he reports from Inlines Agricola, then Proconful of Britany, of our ancient Britifh Nation, whose factions and differtions amongst theinfelues gaue occasion to the Romane victory, and nor the Romane valour wherein he confessed them no way to I and inferiour. To ftrengthen this affertion, Hiftory will afford an evidence almost in cuery corner of the world, wherein we shall find the North by fundry conquests to have prevailed against the South. In the East parts we find that Cingis Can a Nor-Gg ' 3 therne

therne Tartar conquered the Indians: That the Tartarians also conquered the Armenians; and yet the Armenians had fuch advantage against the Southerne people, that the Mamaluter efteemed a firong Nation in Le pp, were first chosen out of Armenia. Also we find that the people of Cathay subdued the Chinois and the Indians. We read also that Mahomet a Saracen Sultan of Persia, hired certaine Northerne Serthians, with whose strength he oues threw the Caliph of Babylon, who dwelt afterwards in Turcomania. Neither wants America many examples in this kind, and no question but many others have bin drowned in obligion for want of History. We find that the people of the North in this Continent prevailed against the South, and conquered Mexico, which was afterward subdued againe by Cortese; and by later discovery of our English nation we are given to understand that the people about Terra de Laboradore are a fierce warlike people, infomuch as rather then they would yeeld themselves to be taken captive by our men, they have bin feen to make away theselves. To goe no further then our own country, who knowes not how many famous ouerthrowes have in later Ages bin given to the Spaniards and the French; especially to the later, who have feared the vtter vndoing of their State : yet neither of these two great Kingdomes could ever attempt any thing against the English worthy Chronicle or observation: If any man object the actions of King William the Conquerour, we can answere many waies: first that he wanne the foueraignry not meerely by the fword, but by Agreement and composition, challenging a promise from King Edward the predecesfour, and being fortified with a strong faction of the nobility of the Realme : and moreouer the malice of the Subjects a. gainst Harald being an vourping Tyrant, gaue great spurres to his victory: wherefore we cannot judge this a true Conquest: yet hath England bin conquered of the Danes a more Northerne people, and suffered many inconveniences of the Scots, but yet were neuer able to conquer them viterly, or bring them under subjection; although fewer in number, and neare their Confines. Now for the second clause, that the people

ple of the Middle Regio are more provident in prefernation of Common- wealths is warranted out of the same grounds: for to this two things are necessary, to wit, Armes and Counsell: whence they vsed to paint Pallas armed, to figuife that not onely strength, beconnfell was necessary for the establishment of kingdomes. The Southerne people (as we have the w. ed) being altogether addicted to contemplation, have bin vnable either to defend themselves or repell an enemie. On the other fide the people of the North having frength sufficient to affault, for want of prudence and countell could never long enion their Conquests, so that we shall seldome read of any great Empi e established of either. But the middle people hauing strength to subdue the Southerne, and policy enough to cuercome the frength of the North, have established many great and famous Empires. Here for an ample exemple wee may produce the State of the Romane Empire, which borrowed Lawes and discipline from the Gracians, nauticall Sciences from the Sicilians and Punicks, military discipline from their daily exercise: and therefore was it no great wonder, that in state and glory they surmounted all other Nations. On the other fide we find many famous victories atchieued by the Northerne people, yet could they never leave behind them any large Empire, but as eafily loft as wome their Kingdomes. Thus fared it with the Goth s, the Hunnes, the Heruli, and the Vantals, which with fo many strong Armies invaded Europe, and Asia, who neverthelesse for want of wildome and forefight, could not hold what they got, or lettle therein any state of long continuance.

The extreame Regions in manners, actions, and cultomes, are cleane opposite, the one to the other. The middle partake of mixture of both.

That the manners of men depend on the naturall complexion and temper, is warranted as well by experience as approued testimonie of our best Philosophers. For howsoever grace or education may make a change; yet this is extraordinary, and these raines once loof dimen easily returne to their former disposition: How much the Northerne man differs from the Southerne in naturall constitution, we have formerly taught; out of which we cannot but conclude, a great disparity in manners and customes: Yet to shew a more speciall & euident demonstration, we will make a particular enumeration of such affections as are incident to the northerne and southerne man, and out of the comparison make our judgement.

First therefore, it is manifest out of ancient and moderne observation, that the Northerne man hath bin taxed of too much levity and inconstancie: The Southerne man contrariwife of too much peruerfe stubbornesse, as well in opinion as affection. The reason of both we have before specified, to be their naturall complexion: which in the former is inclined to fanguine, in the later to Choller Aduft, and m. lancholy; whereof the one is the more subject to change or impression, then the other. Galenderiuing all vertues from the humours of the bodie, makes Choller the mother of prudence, melanchily of constancy blond of mirth fleame of mansuetude: Out of the mixture of which humours, infinite variety arifeth. And because these humours are seldome equally, or proportionally combin'd, and temperd together; they become the fources of infinite vices: Wnich Inequality of temperament is rather found in the extreame regions: And therefore no marvaile if they are observed, to have bin subject to greater vices then those of the middle region : For the mutability and levity of the Northerne Nations, we can have no greater argument then the change of religion: It is written of the Offregothes & Visigothes, that being expulsed by King Attila, they belought Valens that he would grant them a dwelling place: coditionally promifing, that they would submit theschies, aswell to the lames of the Empire, as to the Christian Religion. Which hauing obtained, they fled from their promile and pe fidioufly burnt the Emperour aline. The Gothes, affocue as they came into Italy, embraced the Christian religion, but soone ranne into Arrianisme: The people of Groenland according

ding to Munkers relation, being of a mavering disposition, Soone lik't the Christian religion, but soone relapsed to Idolatrie. The Turkes bring a kind of Scythians, afloone as they came into Afia, without any great conftraint, embraced Mabumetanisme. The Tartars likewise, without any enforcement veelded first to Christianity, and soone fell backe to the Arabian rites. The Normans comming into France although very rude and barbarous, rejecting Gentilifme, Paganisme, subscribed to the Christians. Assoone or sooner the Manders fell from Idolatrie to the true religion. The Bohemians and Saxons first cast off the Romane yoake; which were seconded by all Saxonie, the Cities of the Baiticke fes, Denmarke, Norman, Suedia, Helvetia, and Britanny. The revolt of these nations from the Romans Subjection, I cannot tearme levity or inconstancy in their cheife leaders and reachers: Being fuch as upon long deliberation and mature advice attempted that, which they knew to be most consonant to truth & reafon: to whom without doubt God almighties hand was not wanting. But for the rude and rulgar people to be so soone wonne, and turned from one opinion to another, without longer deliberation, was argument of a mutable disposition; Sith there can be no greater token of Inconfrancy then to make an absolute change of religion in all points in so short a space: whereas the religions being to nearly affined, the one to the other, no man at first fight, out of reason and discourse would embrace or teiect all grounds together, but by degrees : No leffe argument of levity in those Northerne people, is the diffraction and division of them into so many fortes and factions of Religion, as we find now in Germany, Belgia, Polonia, and elfe-where, which no doubt at first proceeded from one or few beginnings. But on the contrary fide, if we looke on the Africans and Southerne people, we shall find them as obfinate and perserfe in standing to their owne propositions, as ready to tax the Northerne people of leving and Inconstancie. For fuch hath bin the fetical conflancie of these nations, as well Africans as Afaticke; that no meanes could be invented to draw them from their or alon, but either heavenly miracles.

or force of armes. Which confrancy hath bin apparant, not onely in men but alfo in momen and chi dren : which made Antiochru even mad when he by all crusity cortured the jeven Sonnes (as we find in the booke of the Maccabers) yet was as farre from turning them from their Cerem my of forbearing the eating of Swines-flesh, that both the mo her invited them, and the Children willingly fubmitted them selves to Martyrdom. Against this constancy, Atah met, when neither by fained mi acles nor persuasion he saw he could prevail, betooke hintelfe to Armes; for the establishment of his distipline which otherwise he could no water have brought to palle. And it is ftrange to fee the lewes at this day, which being a pe. ple dispersed over the face of the whole Earth, groating under the tervile yoake of subjection, having no King, or supreame governour of their owne, have so obstinately retained their religion, for these three thousand yeares. What shall I speake of the Mahumetans in Afriche and Afric of the Indians, the Chinois and other Southerne people, which having once feeled a platforme of Religious discipline, are impregnable against all persuasion, mainely opposing themselves against the grounds of our Religion, having not fornuch as the principles of nature to support their owne. To let paffe the ordinary commerce and traffick, with Christian nations, which in foevident a case, might probably beget some fruits; the admired Inda frie of the lefutes, er ching their Colleges amongst them, night feen e to promife greater matters. But as I have credibly bin enformed, by fuch as have travailed, aswell into Turky as Africk and India, the event of their labours hath come to farre short of expectation, that they hane by their conference rather engendred a worse opinion of Christianity. Which though fore may impute probably to their indirect meanes and superstitions rites, imposing on the conscience, what God neuer commanded, but rather forbad : Yet who fo shall observe the cunning and subtilty of these Sophisters will rather ascribe it to the perverse and stubborne disposition of the people, vnapt to receive any new impression: For elle, who could imagine they could be so powerfull.

full in perverting and infecting others with their Romane !uperfittion in thele parts, having their consciences better enformed out of God's word, and their understandings ordinarily better taught, in principles, and every way more ffrongly fenced against temptation. As these Southerne nations alwaies boafted of their owne (onfrancy as a prime vertue, fo ceased they not to vpbraide the Northerne man with inconfrant levity. This the Italians object to the French, and Germans (as we finde in Tacitus). The Greekes heererofore to the Italians, the Cretians to the Gracians, the Hebrewes and Leyptians to the Greekes and Cretians; On the otherfide the other have somuch complained of their perverse and setled Superficions. For to judge indifferently of either, they are both vices declining from that golden mediocrity, which we call Constancy. For the defect is lenity, the excesse Pertinacy: and as it is very culpable in any man to turne with enery winde; fo it is as great an indifcretion, to be fo wedded to our owne opinions or affections as to tu ne on no occasion: Because all things under the funne are subject to change and alteration: And therefore it is the part of a wife man to accommodate himselfe vnto the object, and not in a fond dreame to wrest all the world to his owne fincy. For a wife Sea-man will rather obey the florme the i feeke his ruine, and when he cannot recouer the port, will turne to any other point for his owne preservation. I speake heere onely of matter of state and policy, and not of religious altions, otherwise then concerne the externall rites and Ecclesiaft all d scipline, the most part of which, by wi e men haue on esteemed no other, then matters indifferent which may admit of change and alteration. But heere some one might object that the French of all Nations, have bin generally taxed of lightneffe and inconstancy, being notwithwittanding in the mittle region, more North then the Africans, yet more south then the Germans or Seyshians; I cannot altogether excute hem of this National blemish, yet with their countryman Bodin, I hold it more fitly tearmed temerity then lever, being a people very quick and agill, aswell in speach, as action in formuch as the executions H h 2 of of matters with them many times are past, ere the Spaniard can enter into confultation: for as the Spaniar counsell is ever flow, & full of delayes, jois the French too heady & hastie: & as delay to the one, to rashnes to the other hash proved dangerous. The mediocrity betwixt both being a promptifued or alacity in effecting matters, is to be esteemed as a virtue, wi ich we find in the Italians, whose action is quick enough, yet con monly grounded on sufficient deliberation: yet if we compare the two extreames, we shall find the Spanish delaies to have overcome the French hastinesse, being farre lesse subject to errour, then the other.

Another difference betwixt the Northerne and Southerne man is discourred in the Affection of Anger and Renenge. The Northerno man though quickly moued to anger, and very furious, prouokes his enemy to the open field, and after a litle time is quickly pacified, forgetting the injury. The Southerne man contrary wife is not fo quickly inraged, but being once prouoked, pursueth his revenge by secret stratagems, rather then open fury, and will neuer or very hardly be drawne to reconciliation: which base and brutish disposition ariseth not so much out of their euill education (as some have imagined) as out of melancholy ill tempered. A proofe whereof we have in most men amongst vs, of a melancholy diff oficion, which according to our common prouerbe, threaten danger and hatred implacable: of this disposition were Aiax and M. Coriolanns, whereof the former for want of reuenge, in a diffracted fury fell on the heards of cattlethe other would by no meanes be reconciled to his Countrymen, till he faw all their Cities in flames. Of the crueltie of the Africans many histories have gi-Bentestimonies, especially Leo Afer, speaking of the Carthaginian diffention: and with later Writers mott memorable is the story of miserable Mulleaffer deposed of his Crowne, his eyes burnt out, and his face diffigured, tendring his complaint to the Emperour Charles. This cruckie hath no leffe bin obferued in the most Southerne Americans, with whom it is a custome to bathe their children in the bloud of their slaughtered enemies, to drinke their bloud, and banquet with their carcases: And if we examine the originally derived so the Southerne lawes, we shall find them originally derived so the Southerne people, which the Northerne Man hath seldome vied but vn-willingly in matters of horrible treason. And not without good reason have our Lawes taken other coards for the conviction of malesactors in cases of fellony and inurcher, then the extortion of confession by extreame tortures, a timing common with the Italian; because (as some of our Statists have observed) our Nation is by nature more apt to confession without terture, and so scareful of torment, then they will more willingly be brought to the block or gallower, then the rack; wheras the Southerne people being by their melancholy temper more scarefull of death, and obstante in their opinion, will yeeld

rather to the greatest torture then conf. flon.

Thirdly we shall find as great a disparity betwixt the Northerne and Southerne man in the fluttilh carele fuelle of the one and the cleanly restrelle of the other. Tasitus reports of the old Germans, that they lived at home in their houses in fordide manner almost naked, and that they vied the fame roomes as receptacles aswell of their beafts as of themselues: which cuflome we shall not find much changed amongst force, if we read Lipfin speaking of the West phalians, or have so much patience elfewhere to make experiment. It is also reported that the Scribians whenfocuer they found themselves oppressed on the way, or in the warres by hunger or thirft, were wont to open a veine under their hories cares, and to fuck out their bloud, and to banquet with the fl-fb, as we read of Tamerlane's Army on the like occasion: but the Southerne people are of a neat and cleanly disposition, abnorring all fordide & vncleanly action, ving often bathings & washings, not only in facred and Ecclesia ficall matters, but also in prinate. And therefore no wonder if (as l'enophon among the Ancients reports) that amongst the Parsians it were accompted a very vnmannerly thing to fpit; or that amongst the Abyfines (as Alvarez writes) it should be deemed a most hainous and flagitions crime, to drop any filth or fpittle in any of their temples. An argument of this may be their extraordinary affection of near &c Hh * 3 dainty

dainty delicates, which (as Athenaus relates) is most noted in the Aliatickes and Egyptians, by which meanes M. Antheny a luxurious spend-tarift, finding bimselfe by Cleopatra furmounted, he smiled at his own ambition in that kinde, and lattehed at the Romans his own Nation as ignorant and barbarous. Of the Persian Theophrastus writes, that by a certain Law certain great rewards were promifed to fuch men as had invented any new kindes of Delicates or pleasures, which is a great argument of the licorous affection of this Nation. A fourth difference may be discourred in the conversation of the Northerne and Southerne Man For the Scythian and Northern man is naturally addicted to company and fociety, as may appeare by the communion of many men in one place in the fields, who amongst the ancients were tearmed Nomades, and are now called Hordes; in which manner the Tartars live at this day: also it is well knowne how much the Germanes, Brittaines. Danes are addicted to company, infomuchas they can hardly live long without companions. But the Son berne man being (as we have proved) of a melancholy disposition, chusech rather to live folitary, and to lirke in woods and defarts, then among to ople: Neare to which nature come the Italians and Spaniards who affect rather a retired Granity, then an open fociety, and converse but at a distance, rather for formality then friendship. 51", no lesse disparity in the disposition of thesenation ons shall we find as wel in the Languages they ordinarily vie as the kinds of musick which they affect : for the former we may generally observe in the Northerne Languages a rough collifion of confonants and aspirations, as in the German and Robemian Tongues. Neither is this observed only in their native Tongues, but also in their vse of the Larin Tongue, in pronunciation of which they cannot but mixe rough aspirations; as I have observed oftentimes in the Northerne Germans, who commonly pronounce firum for virum; fulgus for vulgus, Pipi for bibi, with diverte other of the like nature : as vnable they are on the other fide to give any foft afpiration his due found. but commonly leave it out altogether, or pronounce either the vocales media for vocales tennes, and asbiraia for media, which proceeds

preceedes altoget er from the immoderate ftrength of best & force of the firsts. But the Southerne people contrary wife wanting that degree of heat, in their pronunciation abiline from these hard aspir tions and collision of many commonants together, without v. wels to molbite the harfhnes; as we find in the Greeke L. tin, Spanist, and Italian rongues, which live nearer to the South. Allo the Turbib, Arabian and Perfian tongues are by tuch as are experience in them, find to be freet and elegant. Allo it is to be noted, that as often as the Colonies of the North have invaded the South, although retaining the fame foote fleps and original, have no withflanding much altered their pronunciation not only through the mixture and impression of other languages, but also through the nature of the place, as we find the Gotish tongue of the Spaniards to be changed to a smoother and sweeter pronunciation, then that which is retained in Scribia. I speak not of the Latin mixtu e. but of the meere Gotish words, which we shall perceive mollified with more vowells, and fee to a fweeter termination. The like may be observed in the Hebrew tongue, which (as Iof phus Abud chnon fortimes a Reader in this Vniverfity obferried) to the ease founded farre sweeter in the Arabian, Turkifb, and Persian dialects then it's owne originall; not that it is in them more perfect (which were impiery to belecue) but because men in pronouncing o' a language preferring pleasur: before significancie, hau mollified it, with fost vowells and aipnations, rather to ferue the eare then underflanding. No leffe affectation shall we find of diverte fortes of mujick, forting with their diverse dispositions. The Northerne mans humour confortes best with the Phrygian meafure, a loud and firring harmonie. The Southerne man hauing his spirits more mollified affects the Lydian: The people of the middle region, are most of all delighted with the Dorick, a mutick heeretofore vied in facred exercites. They who know these measures exactly, and which is agreeable to this or that mans fancy, will give a probable gueffe vnto h's naturall disposition. To runne over all the differences in manners and cultomes of the Northerne and Southerne nations were a matter infinite; wherefore it shall suffice to wrap vp all in a generall recapitulation. If we compare the Northerne man with the Southerne, we shall find the one white & red, the other black or tamney; the one big-b ned, the other small and dwarfish; the one strong, but easie to be decemed; the other meake, but witty and circumspess: The one given much to wine, the other exceeding sober; the one neglecting both himselfe and others; the other exceeding sober; the one neglecting both himselfe and others; the other exceeding the minded; the one prodigall, the other parsimmious: The one temperate, the other lecherous; the one a sloven, the other neat and handsome; the one plaine and simple, the other crassie; the one a soldur, the other a Priess; the one a workman, the other a Philosopher; the one standing on the strength of his hands; the other of his wit.

Out of the mixture of these extreames, it is no difficult matter to draw the disposition of the middle Nations. For finding the two extreame nations of the North and the South to be not onely diverse, but for the most part opposite one to the other, in disposition and manners; it were very rationall to judge the middle to have a mixture of both, which obfervation will also approue: For if we compare the middle region with either the extreames, we shall find no such apparant diuersitie, as betwixt the extreames themselves. Heere Monsieur Bodin dreames of a golden mediacritie to magnifie his owne Countrie, which he finds in his middle region, For fithence both these extreames challenge an extremitie of disposition, he imagines this middle tract onely reserved for vertue & temperance. But if he justly weigh all in the ballance of impartiall indgement, he shall finde no such advantage. For first out of his owne grounds, to which we have hitherto asfented, he afcribes to the extreamenations an eminencie both of vice & vertue: Then cannot the middle challenge these qualities otherwise then remitted, and of lesse force. If therefor e he would have their inclination to vice more moderated. and correded; he must also confesse their disposition to vertuom actions to be of lesse validity. Againe these middle nati-

ons are to be accompted either directly fituate betwirt both the extreames, or more inclining to the one then the other: For these directly in the middle, we must imagine them to pertake of both dispositions, aswell to vice as to vertue, borrowing from either extreame aswell good as bad: Heere therefore can be found no difadvantage: For if they will boaft of the vertues of either, they must likewise be ashamed of either viees: If they plead a moderation of the former, they must loose fo much reputation in the later. For these which more nearely incline to the one then the other, it will be apparant that as they approach the one in one quality, so they are farther off in another; as if they approach nearer in contemplatine wit to the Southerne people, so will they come so force short of the Northerne valour. For by how much more they come neare the vertine of the one, so much come they short of the others Affections. The like may be judged of their Imperfections: fo weighing reason with reason we shall find no such inzquality and disproportion to magnifie the one, or vpbraid the o. ther: for that Almighty Creatour of all things is wont to distribute his bleffings in proportion: & Nature nis soueraigne hand-maide triumphes in nothing more then variety. have we spoken as farre as history and observation can instine of the lawes, customes, and manners of the Extreame & middle Nations, in which we have chiefly tied our discourse to the Northerne and Southerne people in this Hemispheare having few histories to leade vs to the confideration of the other opposite on the Southerne Hemispheare : yet the causes being like, we may out of the former be able to give a judgment of the later .

8 Hitherto have we treated of the people of the Northerne & Southerne Hemispheares, with the special subdivision of each into Extreame or middle: It now remaines that we speake of the division of Inhabitants

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according to the Longitude.

According to the Longitude, Inhabitants are either in the Easterne Hemispheare, or Westerne. Those I tearme of the Easterne which line betwixt the Canaries and the Molucco Ilands on this side: The Westerne those which dwell betwixt those two on the other.

These two Hemispheares of the Earth haue by some bin called the Old and New-world; because the former containing Europe, Asia, and Africk, hath bin knowne to the ancients as the portions of Noah's three sonnes, Shem, Ham, and laphet, whereof (as the Scriptures testifie) Shem had Asia, Iaphet Europa, and Ham Africa. The other containing America the South-continent, and some other Ilands, have bin since discovered. Of the comparison of the Inhabitants of these two Hemispheares we will insert this Theoreme.

The people of the Easterne Hemistheare in Science, Religion, Civility, Magnificence, and almost everything els, are farre superiour to the Inhabitants of the Westerne.

For demonstration of this point we need not spend much time; first it is manifest that this Hemispheare was peopled a long time before the other, which is a probable argument of their entere and civility: because all these matters have commonly their growth and perfection with time themother of all perfections. That this part was peopled a long time before the other, is most credible: for it is plaine out of the holy Scriptures, that the first off-spring of mankind was in Asia; whence it could not disperse it selse into America and other parts of

the Earth, till fuch time as their populous growth had required larger bounds. The passage from Asia into America without doubt had bin performed either by sea or land. By Sea it was improbable they should adventure in that infancy of the World, when the Art of Navigation was in her swathing bands, and neither the Chart or Compasse as yet invented. If by land they made their passage, it was doubtlessethrough the North of Afa, supposing America with Asia to be one Continent. But this people comming out of a pleafant and temperate Country, would without question first attempt the places of the like quality, as most pleasing their eye, and fitting their disposition, before they would inforce their paffage to the leg and frozen Climate of the North, which can only be beholding to necessity for habitation, Hence without donbt it came to palle, that those Nations wandring farre from their first fountaine, and leaving no sufficient monument to instruct their posterity in their first originall, came short of the other, aswell in revealed as acquired knowledge: in revealed knowledge, either fought in Holy Scriptures, or Traditions, they cou'd not but come fhort, as being most diftent from the first head and fountaine where it was to be found in greatest perf . Ction. In Acquired knowledge gotten by industry and experience they could not come to farre as the other; because all fuch knowledge having it's beginning from observation, and it's growth with age, could not be brought to that perfection amongst them, who came more lately to be a people, and fearce euer endowed with any fettled gouernment: but whatfocuer the causes may be thought of this diversity betwixt the people of the Westerne and Easterne Hemispheare, certaine I am that the effect it feife is most apparant. Of the happy endownents of Europe, Afia, and a good part of Africke, both in Arts liberall and mechanicall, state, policy, magnificence, and Religion, we have often spoken, and neede make no repetiti n. To this if we compare America, being (as it were) the only portion of this Hemispheare, we shall among it them find few or no Artseither invented or taught, the vie of letters scarce euer knowne; state and magnificence litle regarded, and the Light

Light of Christian Religion scarce euer seene, or at least through the dimme clouds of Roman superficien. He that would know more in this matter, let him read Peter Marryr, Corresion, Asosta, and others, of the natural disposition of the

people of America.

The Inhabitants of such Hemispheares are againe subdivided into the Easterne and Westerne: the Westerne in the Easterne Hemispheare, are they who live nearer the Canaries: the Easterne are such as are situate towards the Moluccoes: to which those other in the Westerne Hemispheare are correspondent.

The Westerne people have bin observed to be more happy and able in martiall disciplines the Easterne in witty contemplation, &

speculative Sciences.

There is no small affinity (as we have before touched) betwist the West and the N. rth, as betwist the East and the South; as well in the temperament of the Aire, as the disposition of the Inhabitants: which cognation will appeare more fully by the proofe and demonstration of this Theoreme. Of the strength and valour of the Westerne people, many records give euidence; we read of innumerable Colonies of the Celter a people situate on the West of France, sentinto Italy, Greece, & Asia. But the Italians durst never invade France, till such time as their Empire was at the hight vuder Casar, taking also advantage of the home-bred enmities of the Inhabitants among themselves; whence Tully the Orator tooke occasion to praise Casar for subduing those Nations, and reducing them to the Romans obedience, whose strength the Romane Empire could hardly sustaines. The Italians have oftentimes molested the

Gracians, yet from them suffered little or small inconvenience; to the Grecians having with their Armes cut out a large way through Afia, scarce ever dared to come into Italy but once under the conduct of Pyrrhiw, who being almost defeated of his Armie, was inforced to faue himselfe by flight. In like fort Xerxes who brought men enough into Greece to dry vp the Rivers, was not withflanding defeated by a few Graciens to his great dishonour. Wherefore Care had good reason to object to Maran, and Cafar to Pompey, that their warres waged against the People of Afia in respect of others were (as it were) rather against women then men. This without doubt gaue Alexander his greatest happines and victory, that he curned his Armes against the Easterne people, which were either altogether barbarous, wanting martiall discipline, or all ouer delicate, not able to refift fuch hardnes: whereas if he had opposed the Westerne people (by the censure of Levy) he had at least failed of those many Conquests, if not purchased a fatall ouerthrow. The observation perhaps of which couragious valourin the Westerne people was the cause why the Turkes heretofore were wone to chuse their lanifaries, and chiefe men of warre out of the Europeans, accompting them more ftrong and able then the Afiaticks, being of temper more fost and delicate. To this accords Inhan in his booke against the Christiaus: the Celtes (faith he) are Bold and Advent mous; the Greeks and Romans both warlike and cinill: the Egyptians more industrious and subsile, although weake and tender. The Syrians with great alacrity conforme themselves to discipline: And a licle after hath these words: What shall I declare (faith he) how coverous of liberty and impatient of fervitude the Germans are, how quiet and tractible the Syrians, Perfians, Parthians, and all the Nations fituate towards the East and Somb parts of the World. Tacitus reports, that the Batavians lying on the West of Germany of all the Germans are the strongest & most valiant: which Plutarch also confirmes in the lite of Marius, that the most warlike people of all France are these which are most westerne. The like opinion had Cesar of the Westerne Nations: of all the people of Europe (saith he)

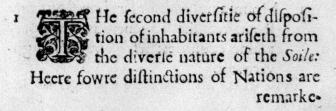
the Westerne people of the Brittaines and Spaniards are the frongest. Now as the mesterne people justly challenge to themselves this prorogative of strength and valour, so must they yeeld to the Easterne, that of Religion and contemplation, To lecuaffe the Indians, which a long time gone, were enriched with knowledge, if we beleeve ancient writers; who can deny the Habrewes, Chaldeans, Syrians, Agyptians, Arabians, and others of the East their just trophies of learning and contemplation, which they have erected to after ages? From these fountaines have the Greeks and Latine derived those large streames, wherewith they have (as it were) watred all Europe. It is written, I hat there came misemen from the East to morship Christ; which roust needs be understood of Children or the places neare adjoyning, where the Meri or wifemen were had in great reputation. If any object the decay both of learning and religion at this day, in the eafterne parts of the world; We answere that this an most parts is mocrely Accidentall, caused by the hestele invasion of the vfurping Turkes, which professe themselves to be viter enemies to learning and the frue religion. To which, we may adde the ignorance of the Christian religion in many places, which is the greatest ground of solide knowledge. For amongst all religions in the world, there is none which giveth more way to learning then the Christian: Whereas some others altegen ther forbid the studie of such matters; yet is not this inclination fo absurde in the Easterne people, but that every-where fome markes and footesteps will discouer their disposition, For in the East shall we find no small number of Christian Churches, and Monasternes professing & bristianity and other good learning. But to speake no more of the Christian religion, which we hold rather by Gods speciall grace, then nature: the superstitions devotion of these beatnen nations to their owne falfe religions, is a sufficient argument of their naturall inclination to religious exercises. How obstinately perverse, Ce emonious, and Seperstition the Indians are found in Idolatrous religions, I have often wondred to heare some rravaylers reporte: Of the other Hemif, heare comprehending

ding America, I have as yet small evidence out of Historie, whereon to ground any certainty; all we can say shall be comprized in this Theoreme.

z The easterne part of the westerne Hemispheare was peopled before the westerne.

This proposition feemes probably warranted, aswell by reason as authority; for first, supposing as an infallible ground; that the first offpring of all nations was in Afia, towards the East; it must needs follow, that to people America, there should be a passage therevnto out of Afia; because America was a long time not inhabited ere it was discouered to the Europeans. This passage then, was either by fea or lands Were it by fea, the first part whereat they could arrive was the easterne side. If we suppose it to be by land (as is most likely in those ancient times) yet was it most probable it should be on the Northeast fide from the Pole, because it is found by observation that on the North-west fide it is divided from Alia by ftreites,: then must they first touch on the Balterne part. To this we may adde the experience of the Custilians and Portugalls (who first discouered this part) who affirme that the people dwelling on that fide, have bin observed to surpasse the mesterne by farre in civility of musners, knowledge, and fuch endowments, which may be an asgument of the antiquity of their plantation.

CHAP. XV.



remarkeable, i of the inhabitants of the Mountaines and plaine-Countries. 2. of marish and dry. 3. of windy and quiet. 4. of sea-bor-

ders and Inland people.

That mens dispositions are diversly varied according to the temper of the foile, euer mans owne experience may eafily enforme himsfor to referue perticularinflances to their proper places, it is most manifest that all the vitall operations of the fouls depends aswel voon the corporeall and organical parts, as the spirits, which being diversely affected by the qualities of the Aire, and Earth must needes vary and suffer a change. Plaine and evident disparity is found: first betwixt two nations fituate in the fame Parallel or climate in respect of the heauens. Secondly betwixt two men borne in feuerall Comerus living together for some time, in the same region. Thirdly, of one and the felfe-fame man living at diverse times in diuerse regions. Fourthly, of a man living in the same Conutry at diverfe feafons and times; all which being heeretofore demostrared will declare vnto vs the great Sympathie, and operation the Aire and his diucte qualities, hath with, and on our corporeall spirits and organs. But the temperament of the Aire(as we have formerly shewed)depends on the temperature of the foile: whence it must needs follow that the naturall disposition of men should be varied somewhat in respect of the foile. This disposition of the foile being monifold, we have reduced onely to three heads: leaving other curiofities to fuch, as have more leafure: What we judge in this, shall be declared in these Theoremes.

Mountaine people are for the most part more stout, warlike and generous then those of plaine countries: yet lesse tractable to government.

Of the warlike disposition of the mountanists and their strange

ftrange Impatience to Subsection, many Histories give testimonie. Geographers report, that fetting afide the people of the North (to whom for frength & valour we have given the palme.) the Inhabitants of the mountaine Atlas are great and frong, out of whom the Kings of Namidia and Manritania in time of warre are went to levy their forces. And it is worthy admiration to confider the mountaine people of Arabia, who could never be drawne to yeeld to lubjection, but being fortified not fomuch by the benefit of the place (as some might happily imagine) but rather by natural! Arength and valour, have alwaies hued in liberty. To whom (as is reported) the Turker give a yearely stipend to keepe them off from inviding the Territories of Palastine and Da. majous. Of the Marfians the ancient Inhabitants of the Apperine mountaines in Italy, the Romans were wont fo well to conceine, that it grew into a proverbe: Sine Marsis triumphasse neminem. Gostane, when he went about to invade the kingdome of Succia, chose his legions of soldiers, out of the Dalecarli, who inhabite the Succian mountaines, But amongst all, no nation hath purchased a greater of inion and reputation then the Heluetians, living amongst the Alpes. Thele men are originally descended from the Succians, which for valor, have to farre approved themselves, that they have not onely kept themselves free from torraigne jurisdiction, but have often delivered their neibouring countries from flauery & oppression. Against the house of Austria they have not once displaied their banners, and triumphed in their ouerthrow. A great part of Germany hath smarted vader their valour; and fuch an honorable opinion have they wonne, that they are accompted (as it were) the Cenfors and moderators to decide controuerfies in matters of flate and kingdomes. Cisero gives great commendations of strength to the Ligurians inhabiting the mountaines: It is well known how long and tædius warres the mountaine Cilicians and Acroceraunians had with the Turkes: how long with small damage they endured affront, & droue them back. Here we might add the examples of the Biscanes and Cantabrians in Spaine, who vn-

der the conduct of Pelagius their King, withstood the Saracens, and preferued both their language and religion. The like ought be spoken of the Welch and Cornish people amongst vs. as of the Scottish Highlanders: all which living in mountanous countries have withstood the violence of forraigners, and for many yeares preserved their owne liberty. And howsoever it may be objected that the advantage of the place gaue them courage, yet 'can we not deny their disposition due commendation; having not only thus for a time protected their owne rights, but made many hostile invasions on their encmies. Hence Bodin would make a certaine Harmony betwixt the mountaine people, and the Northerne, effecting the inhabitants of the Alper, the Pyraneans, the Acrocerauny the inhabitants of Hamus; Carpathus, Olympus, Taurus, Stella, Cancafus, Imans, with diverfe others of the fame nature, albeit fituate in the temperate part, to bee accompted northerne people: as also farther towards the South, the inhabicants of Ailas, of the Arabian mountaines, of Pirus and Seraleona, are(as it were)by him excepted from the Southerne inhabitants, in regard of their high and mountanous situation; which recompenseth the other, and challengeth as much cold, as by the heavens it should seeme to receive heat. This contest of Monfieur Bodin, ladmit without any great contradiction, were he not ouer peremptorie in ouermuch censuring all mountanous people of blockiffmelle and barbarifme, against the opinion of Averroes a great writer; who finding these people meter beanen saspected in them a more beanenly nature. Neither want there many reasons, drawne from nature and expiriment, to prone mountamous people, to be more pregnant in wit and guifts of vider flanding then others, inhabiting low and plaine Countries. For towfoener wit and waltur are many times divided, as we have Thewed in the Hor herne and foutherne people, yet were they never formuch at variance, but they would formetimes meere. Fifft therefore what can theake more, for the witty ten per of the mainsame people, then their eleane and label e Aire being farre more purged and ranfied, then that in him countries: For holding.

holding the vitall spirits to be the cheifest instruments in the foules operation, no man can deny but they fyinpathrie, efpecially with the aire their cheifest foment. Euery man may by experience find his intellectual operations more vigorous in a cleare day, and on the contrary most dull and heavy when the aire is any way affected with foggy vapours. What wee find in our felues in the dame place at diverse seasons, may we much more expect of places, diugrfely affected in constitution. A fecond reason for the proofe of our affertion, may be drawne from the thinne and share diet, in respect of those others. For people living on plaines, have commonly, all commodifies in such plenty, that they are much subject to surferting and luxurie, the greatest enemy and ynderminer of all intellectuall operations. For a fatte belly commonly begets a groffe head, and a leane braine; But want and scarcity the mother of frugality, invites the mountaine dwellers to a more sparing and wholsome dier. Neither growes this convenience oucly out of the learcity of viandes, but also out of the nature of the diet. Birds, Fowles, and Beafts, which are bred upon higher places, are effected of a more cleanely and whole-Some feeding, then others living is fennes &foggy places; And how faire the qualitie of our diet prevailes in the alteration of our organs and dispositions; cuery naturalist will easily refolue vs. A third reason may be drawne from the cold Aire of these mountanous regions, which by an Antiperistasis keepes in, and firengthens the internall hear, the cheire instrument in natural and vitall operations. For who perceiues not his vitall, and by consequence his intellectuall parts, in cold frosty weather to be more strong and vigorous, then in hot and foultry feafons, wherein the spirits are a ore diffused and weakned. This disparity in the same region, at diverse times, in regard of the disposition of the aire, may eafily declare the disparity of diverse Regions, being int is fort diversely affected. A fourth reason may be taken from the customary hardnesse, whereverto such people inure themselves from their infancy; which (as Huarius proues) begets a better temper of the braine, in regard of the wit and under-K k * 2 standing.

flanding; which we happen to find cleane otherwise with them, who have accustomed the nfelues to delie streffe. Thefe reasons perhaps would seeme onely probable, and of no great moment, were they not frengthened with forraigne and Domelticke observation. Have not the Helvetians situate amonght the mountaines, given fufficient testimony; especially in the infancie of our Reformation? Have not the Snevians & Silefians shewed themselves able enough, to wipe off the blot of a blockish disposition; yet having a situation wilde & mountanous? Had that great Doctour Renelin judged well of the nature of fuch people, he would not have made it so great a wonder as he did, that wilde Suevia should produce such learned Men. Forraigne inflances elsewhere wherin all hiftories aboud, I forbeare to relate; defirous rather to be accompted deficient then tedious. Should I draw home to my native Westerne Confines, to which I owe my breath, I should perhaps by some be taxed of partiality or affectation. Should I mention our ancient Brittaines, inhabiting the Mountainous Country of Wales, or the greatest part of the Scottish Nation, injoying the like condition of life, and difposition of the Soyle: I might at once winne love, & stirre vp envy. Neuertheleffe, as a man by nature borne careleffe of Detraction, yet most respective of Friendship, I had rather venture my credit, then prejudice the truth: betwixt both which with me the choice is easie. Mine owne Country of Deven, which duty commands me to make the first Instance, I had rather fer on the stage of Envy, then Dishonour. I am not of the opinion of the vain-glorious Greekes, who boa-Aing too much of their owne perfections, esteemed all Nations els Barbarians, Yet to check M' Bodin's bold conje-Eture, out of which he could finde but one Anacharfis in all Scythia; I will demonstrate that our mountainous Provinces of Deven and Commall, have not deferred foill, as to be fo Marply centured for Block shneffe or Incivility. Barren Countries have bin known to nourish as good wits, as Rodin, Aristippus the Philosopher, Calimachus the Poët, Eratosthenes the Mathematician, have not binashamed to call Grove in E-

gypriheir native Country, a Alomtuinom and Recky Region. Neither can i be filled our reproach, but glory, to draw our off foring from fuch an Aire which produceth wits as eminent as the Mountaines, approaching farre nearer to Heaven in Excellency, then the other in highe transcend the Valleyes. Wherein can any Province of Great Brittaine challenge precedency before vs? Should any deny vs the reputation of Arts and Learning; the pious Ghofts of lewel! Raynold and Hoos ker, would rise vp in opposition; whom the World knowes so valiantly to have displayed their Banners in defence of our Church and Religion. Should they exclude vs from the reputation of knowledge in State and politick affaires? who hath not acquainted himselfe with the name of S' William Petre our famous Benefactor, whose defert chose him chief Secretarie tothree Princes of famous memorie? Who hath not known or read of that prodigie of wit and fortune S' Walter Ramleigh, a man vn'ortunate in nothing els but the greatnes of his wit & advancement? whose eminent worth was such both in Domestick Policie Forreigne Expeditions, and Discoveries, Arts and Literature, both Practick and Contemplatine, which might feeme at once to conquere both Example and Imitation. For valour and chivalrous Defignes by See, who reades not without admiration the Acts of S. Francis Drake, who thought the circuit of this Earthly Globe too litle for his generous and magnanimous Ambition? Ot S. Richard Greavill, who undertaking with fo great a disadvantage, fostrong an Enemy; yet with an undaunted Spirit made his Honour legible in the wounds of the proud Spaniard : and at last criumphed more in his owne honourable Death, then the other in his base conquest? Of S' Humfrey Gilbert, S' Richard Ham kins, Davies, Frobifber, and Capt. Parker, with many others of worth, note, & estimation, whose names live with the Ocean? In the Catalogue of able and worthy Land-Souldiers, whose eye would not at first glance on my Lord Belfast, who lately deceased to the great griefe of his Country, because in such a time which most requires his affiftance? Conrage, & Wisdome, which are often at odds, and seldome meet, in him shooke Kk ' 3 hands

hands as friends, and challenged an equall share in his perfections. His wife managing of his affaires in Ireland, fo well commends his owne Loyalty, and his Masters choice, that the whole Realme may truly be faid for the most part to owe her present Peace to his Industrie. Should I speake of Generous Magnificence and Favour of Learning, shewed by Heroicall Spirits in the general Munificence extended to our whole Vniuerlity; what Age or Place can give a Parallel to renowned Bodley, whose name carries more perswasion then the tongue of the wifest Oratour? His magnificent Bounty, which shewed it selfe so extraordinarily transcendent, as well in erection of his Famous Library, which he (as another Ptolomy) forich'y furnisht, as other munificent Largeffes, exhibited to our English Athens, was yet farther crowned by his wife choice, as proceeding from one, who being both a great Scholler, and a prudent Statist knew as well how to direct as bestow his liberality. If Founders and Benefactours of private Colleges may find place in this Catalogue of Worthies, the sweet hine and receptacle of our Westerne with can produce in honour of our Country a famous Scapledon Bishop of Excester, and worthy Founder of Exon Colledge: whose large bounty was afterward seconded (next to Edm. Stafford Bishop of Sarum, a Wefterne Man) by the pious charge and liberality of M. John Peryam, S' Iohn Acland, & very lately by M' D' Hatewill, whose worthy Encomium, I (though vnwillingly) leaue out, lest I should feeme rather to flatter then commend his Worth. But what needes he my poore mention? His learned works publiflied to the World, & his Pious Monument bestowed on our House, speake in silence more then I can vtter out of the highest pitch of Invention. To all which I might adde Mt Nicholas Wadham, whose liberall hand having angmented the number of our Colleges with an absolute and compleat Foundation, hath left Muses enough to preferue his Name vnto eternity. Had I the like priviledge to mention the living as the dead, we should not finde wanting out of the ashes of these generous Heroes of our Devonian confines, many genuine and worthy Sonnes standing up in their Fathers places, to shew the world a fuca succession as well of wits as times. There would appeare at once vpon the stage our famous D' Sutcliffe, the worthy Dean of Excessor, whose magnanimous indeavours, as well in his learned conflicts with our pernicious Romanists, as in erecting a College to oppose our sworne enemies, the lesuites, will (no doubt) lengthen out the end of his declining age with Fame and Immortality I could offer to your admiration the Worth and Workes of our renowned Restor, D' Prideaux, His Maiesties learned Professour of Diunity in our Vniuerstie, in whom the Heroicall wits of lewell, Raynolds, and Hooker, as vnited into one, seeme to triumph anew, and threaten a stall blow to the Babylonish Hierarchie: Insomuch that he may justly challenge to himselfe that glory, which sometimes Oxid speaking of his own Country;

Mantua Virgilium landet, Verona Catullum,

Romana gentis gloria dicar ego. Mantua Virgil, Verone Catulins proife, I will the glory of the Romans race.

Neither want the Lawes of our Land, out of this one fource, fufficient propps to defend their Countries & the Kingdomes right. The admired sufficiency of Instice Doddridge, testified to the world by so large a report, and expressed in his incomparable skill in the Lawes (besides his indowments of Arts and other Learning, seconded by the deserved Fame of Me William Noy) can hardly scape my pen, being so deeply dipped in the midst of my Native Countrey. I care not what envy I sirre vp in others, so my Mother Excester Colledge, which sometimes cherished in her bosome these two worthy Darlings, and since sound har curtesie returned back with interest, indulgeously permit me this liberty.

Besides these choice floures cropt from our Hesperian garden, no question but many more would be found out abuse or dead; whom same, if not injurious, cannot suffer to sleepe without described memory. I have hicherto touched such eminent wits and persons, of whom for their projetions have the Church or Common-wealth have greater reason to take of, exill notice. Many inserious faculties are yet less where-

in our Devon hath diff laied her abilities aswell as in the former, as in Ih losophers, Historians, Oratours, and Peets, the blazoning of whom to the life, especially the last, I had tather leave to my worthy friend M. W. Browne; who as he bath already honoured his countrie in his elegant and sweete Pafforalls, so questionles will easily bee intreated a litle farther to grace it, by drawing out the line of his Poeticke Auncefters, beginning in losephin Iscanus, and ending in himselfe. Bodin perhaps might oppose against vs the emmency of his Parissan territory, as some with vs the glory of our Metropolis and Vniverfices, difdaining all comparison: But to this it is not hard to shape an answeare, I That a Metropolis or Vniuerfity is to be imagined as a common receptacle of the most felected wits derined rather from other places then the temperament of their owne Aire: Infomuch as they may be faid to owe their abilities, for the most part, to those to whom they owe their wealth. Neither can they challenge a greater interest in this glory, then our Townsmen beere in Oxford in the eminent guifts of our choicest Schollers; Besides, that often happens in our great Metropolitan cities by the promiscuous concurse of diverse dispositions; which is reported of the beafts once a yeare comming together to drink of Nilus. of diverse forts; that by vnnaturall commixture, they yearely beget new monsters: Africa aliquid semper apportat noni. 2 The ready meanes of Advancement to high and eminent dignityes in Metropolitan cityes, which are commonly the ordinary feats of Princes, fets many a braine a worke although In vita Minerva, to thew it felfe in publique: wherein he hath the advantage of estimation sooner then sufficiency: wheras many a towardly wit in places farre remote, never finds opportunity fo propitious as to present him to popularity. I scare I shall be too recious in this point, recalling to minde that I shall find few of my readers in this matter so affected as my selfe: Yet should I not have spunne out this theame so long. but to flop their mouthes who being fooner taught to fpeake then understand, take advantage of the rude language and plame attire of our countrymen, admiring nothing more then

then themselves or the magnificent splend our of their owne habitation: As though all the witt in the world were annexed to their owne schooles, and no flowres of science could grow in another garden: But a rude dialett being more indebted to Custome then Nature, is a small argument of a blockish disposition: and a homely outside may shroud more wit then the Silke-wormes industrie. I have formetimes heard a rude speach ina Frize habite, expresse better sense then at other times a scarlet Robe: And a plaine Yeoman with a mattocke in his hand speake more to the purpose, then some Counsellours at the barre: And what other prorogative can fuch men appropriate to themselves aboue vs. but toyes and formalities, the Idols of Gulls and fooles, and the laughter of folide understandings? But now after all this bickering with M: Bodin to grow to a reconcilement, ere we part, we will part stakes, and in the way of kindenesse give him this one distinction, which I hope for quietnesse sake, he will accept . The Naturall disposition of men and their gifts of understanding and mentall faculties, arise either from their naturall Temper, or their Discipline and education: For the former I have small reason to give (as I have said) the excellencie to the inhabitants of plaine and low Countries, rather then to the mountaine people: But in descipline and education I must confesse others commonly to be happier. I. Because the Fertility and increase of the Earth inuiting men to such an Habitation, it must needes happen that such Countries must be more populous, and by consequence settle to themselves a better forme of government, then those which by reason of their barren soile are more neglected : 2 Because, most Cities and Townes where are found the cheifest meanes of Instituteon of youth, are founded in plaine Countries and vallies. This Perfection that such regions boast of, is owed rather to Infitution then Nature: Hence appeares the reason of the last clause of our Theoreme, to wit, why they should be lesse tractable to gonernment: Because being (as it were)borne to too much liberty, they cannot fo well inute themicines to subject. tion, as other who perhaps know no Condition hut ferui-

of the mountainens people of Wales and Scotland, I cannot speake so much as I intended : Both because I have (I feare) rired already my readers patience, as also for that, being not fo conversant in their Histories as mine owne, as an ill herald, I may chance to marshall all amisse. Who so lift to reade the courage of our ancient British nation, he shall find enough as well in the Roman Story, as our English Chromeles, to let them far enough aboue contempt, & place them an eye fore in the fight of enuy. But to leaue Antiquities and come to thefe times, we may eafily amongst many other deferving men fingle out some, whose eminence so obvious to the eye of common observation, is able to dash detrattion out of countenance. Who hath not heard not many yeares fince of D' Helland the Kings Professour in our Vniuerfity, and Sir Roper Walliams a famous Coronell in the French and Belgick warres the Scholasticall Learning of the one, and the martiall prowelfe of the other, was too well knowne to require a Panegrook. Neither is Wales at this day below her felte, but that the can triumph in two of the most Honourable and Generow Peeres of this Land, (to whose acceptance I owe these my poore labours) and the greatest Administrator of Iustice in our Courts: the two former, borne aswell to hareditary vertue as greatneffe: the later advanced no higher then his owne ability, whom the world knowes beyond my expression.

Scarce had I shut up this tedious discourse, spent for the most part in desence of my native Country, but surprized with a deepe melancholy, I entred into a serious consideration of what I had too rashly spoken. I called my meditations to a first accompt, to examine what motive should make me run so farre beyond my intended purpose, to meet the Ambition of my Country or mine owne affection. The remembrance of some grievances, seconded by mine inbred Nature, never taught to sawne on missprission, beganne to check my officious penne, as guilty of too much weaknes or Adulation; when sud lainly as in a vision there appeared virto me my Mother Cassard vision that my this and all his Mass, who with a discontented countenance and harsh language, seemed to chide me in this manner:

Fond Sonne, who taught thy vndeserued praise, To crowne thy country with these thankleffe Baies ? What owest thou vaco that barren Earth But harsh reproach, sad eares, and haplesse Birth What Legacie bequeath'd that foile to thee, But fruitleffe Hopes, and helpleffe Povercy? What thou hast spoken of thy Westerne stronds, Will Cooner plough up mine, then cure thy wounds. Had thy neg ected Muse without a Name, Spenthalfe this industry to spi me my fame, If s had graced thee with Muses more Then ever tript on thy Devanian shore. Which of these Worthies whom thou crown'st with Willere thy wants relieue, or Fortunes raife? (praife All the proud wooers of the Sifters Nine, Like Pilgrims come to worship at my shrine: And vaunteff thou on Deven's part their Names Who owe to me their worth, to her their shames? The prime and choice of all thy glorious flowres Cropt from my gardens and admired Bowres, Ought to returne the tribute of their praife Vnto my golden tongue and learned Layes: Nor had thy Westerne Confines euer found A Muse to sing of thy Devenian ground. Had not I touched her ambitious tongue First taught to chaunt amongst my learned throng. How off haft thou drawne out thy precious time To tutour in my armes their youthly prime, Who like respectles and vntutour'd swaines, With loffe and obloquie reward thy paines? Such are thy Darlings whom thou wak'ft to ride In a triumphant carre by Honours fide; As if proud Honour which can Kings command, As a poore seruant waited on thy hand. Thus thou vnwise giu'st immortality To those, whose base reproches follow thee. Had thine Ambition waited on my springs, The

The breath of Princes, and the pow'r of Kings Had feconded thy Hopes, which now accuse To my diffrace and griefe thy hapleffe Mule. Thy wants inferce thee fill with me to flay, When each Pedant or makes or findes his way. To play and flake it at that lawleffe Game, Selling my Honours for to buy their thame: Whappie purchafe owd to Charine, W Bought by connivence, fold to Perjurie; By griping Brokers, fince the fatall tin e That faire Africa left thy thankleffe Clime. Thus thy admired Deven's characie Sees ffrangers in her lappe and fhues out Thec. Halt thou bin honour'd by my facred Breath, 'Mongst rude Areadians thus to beg a Death? What greater glory can thy ashes have, Then in my flowrie groues to dig thy graue? Although the least among my learned sonies, Thy fortunes told thee that I lou'd thee once. . And fo doe ftill: although my haple Te Baies Taught thy despaire to spinne out carelesse daics, And to compose thy discontented Head To flumber lofilie on the Muses Bed. Be rul'd by me my poore, yet loued fonne, Trust not their smiles whose wrongs have thee vn-Thy faire Hopes grounded on thy place of birth, Will fly in Aromes or confume in Earth; Before within that Hemispherre of thine, Thy Devon's Sunne on thee shall ever shine. Then truff voto my bounty, turne thy light From thy darke Confines to my golden light. All thy endowments owed to my wombe, Returne them b ck, and there erect thy tombe. If no Mecanas crowne thee with his Rayes, Teach thy content to fleepe out quiet dayes. Let Contemplation with transpicroing eyes, Mount thee a pich beyond the flarry skies.

And there prefent thee that eternall glaffe. Wherein the greatnesse of this wondrous masse, Shrinkes to an Asome; where my Aftrolabe Shall they thee starres beyond thy painted Globe: Where thou aloft as from a mountaine ficepe, Shalt fee the greatest men like Antes to creepe: Thy dales shall minister thee choicest Theames, Which night shall render in delicious dreames: And thy severe Philosophy the whiles, In amourous kinde shall courte thee with her smiles. Or if thy nature with conftraint, descends Below her owne delight, to practick ender: Rife with my morning Phabus, flight the West, Till furrowed Age invite thee to thy reft. And then perchance, thy Earth which feldome gaue, Thee Aire to breath, will lend thy Corps a graue. Soone the last trumpet will be heard to found, And of thy load Ease the Denonian ground. M: ane time if any gentle swaine come by, To view the marble where thy ashes ly, He may vpon that stone in fewer yeares, Engrave an Epitaph with fretting teares, Then make mens frozen hearts with all his cries. Drinkin a drop from his diftilling eyes: Yet will I promise thy neglected bones A firmer monument then speachles stones, And when I pine with age, and wits with ruft, Seraphick Augells shall preserve thy dutt, And all good men acknowledge shall with me Thou lou ft thy Country, when shee hareth thee.

This strange reproofe of an indulgent mother, I could not entertaine without passions. In somuch as without feare or wit, I adventured in this fort, to answere her, in her owne language.

Ad Matrem Academiam.

Wakindeit mother, have my former yeares Somuch deferu'd thy hate, or these my teares? 570

Thus to divorce me from my place of birth, To be a stranger to my native Earth? Wilt thou expose him on thy common ftage, To ftrue and ftruggle in an Iron age; Whole low ambition neuer learnd of thee The curious Artes of thriving policy? Thy golden tongue from which my yonger daies Suckt the sweet musick of thy learned laies, Was better taught thy office then my fate, To make me thine, yet most vnfortunate. Why was I foffred in thy learned schooles, To fludy wit for the reward of fooles: That while I fate to heare the Muses fing. The Winter fuddenly ore-took my Spring: Haue I so plaied the truant with my howres, Or with base riot stained thy sacred Bowres, Or as a Viper did I euer striue, Tognawa paffage through thy wombe to thrive: To pluck methus from Deven's breft, to try What thou canst doe when as thy dugges are dry? When my shortthread of life is almost spunne, Thou biddft me rife vp with thy morning funne; And like a Heliotrope adore the East. When my care-haftened Age arrives at Weft. Could I encounter (as I once did hope,) The God of learning in the Horoscope, My Phabas would auspicious lookes incline, On thy hard fate, and discontents to shine: Now lodged in a luckles bonfe, rejects My former fuites, and frownes with fad aspetts. Had I bin borne when that aternall hand Wrapt the infant world in her first swadling band, Before Philosophy was rought the way. To rock the cradle in which Nature lay. My Learning had bin Husbandry: My Birth Had ow'd no toll but to the virgine Earth: Nor had I courted for these thirty yeares,

Thy

Thy feuen proud minions with officious reares: To live had bin my industrie: no tongue Had taxt thy benears, guilty of my wrong. Had I bin hepheard on our Westerne plaines, I might have fung among ft those happie swaines; Some shepheardesse hearing my melody, Might have bin charmed kind as charity, And taught me those sad minutes to reprive, Which I have loft in fludying how to thrive. Had I adventur'd on the brinish forme. And Iworne my felfe a stranger to my home Till time the Harnest reapt my youth did owe, And Ages winter had fpent all her fnow Vpon my haires; what worfer could I have, Then loofe thy frownes to find a wifhed graue? The Scythian hewne from Caneasus would aske Before my flaughter, why a needles taske Of Travaile I should vndertake, to see Their Countries bounds and my fad mystery? But hearing my harsh bondage vnder thee, Would thine vakindnesse hate and pitty me. To fee thy Child far fever'd from thy wombe The Canniball would make himselfe my tombe; And till his owne were fpent preferue my duft, I his deere write which thou haft fleightly loft. Cauft thou neglected fee his Ageto freeze, Whose routh thou dand ift on indulgent knees? The fowle aspersions on my Devon throwne, Thou mightft in right acknowledge for thine owne: Only this difference: to men wanting worth They fell preferments, and thou fends them forth. Canft thou be brib'd to honour with a kiffe Thy guilded folly which deferues the hiffe? If thy forc'd wants and flattery conspire, To fell thy Scarlet to a worthles Squire, Or grace with minivere some profelite Who nere knew artes, or reade the Stagirite,

Yet should thy hand be frugall to preserve That Rock for want of which thy fonnes may starue. Haue I feru'd out three prentifhips, yet find Thy trade inferiour to the humblest mind? And that outstript by vnthrifts, which were fent Free with indentures ere their yeares were fornt? Then ceale ve fifters of the Theftian fprings. Thalia burne thy bookes and breake thy ftrings. And mother make thy felfe a fecond Tombe For all thy offpring, and fo fhut thy wombe. Accuse not my just anger, but the canse Nature may vrge, but fury fcornes her lawes. I fawn'd too long on Justice: Sith that failes, Storme Indignation and blow up my failes; Ingenious choller arm'd with Scorpions ftings Which whippft on Pelants, and commandelt Kings, And giu'st each milky soule a penne to write Though all the world be turned a parafite; Temper my braines, thy bitternesse infuse, Descend and dictate to my angry Muse. O pardon mother fomething checkes my fplcene. And from thy face takes off my angry teene: Revolted Nature by the fame degrees Goes and returnes; begges pardon on her knees: Thou art a mirrour by reflexion taught To faigne defects, yet guilty art of naught. Thy fewards which by thy indulgence thrive Were they as juft, as thou art free to give. We all might share a portion of that store, Which now thy formes deserve, thy flaves devoure, Thy will is feldome measur'd by the Law. But power, whose greatnesse thy Edicts can awe. Slights thy decrees: O would In perial lone But once descend from his high Court aboue, To see thy innocent and maiden hands, By thine owne scruants basely shut in bands: These Caterpillars by his three-forks Rayes. Would Would some be scorch'd from off thy sacred Bayes; And thou restor'd vnto that pristine hue, Which ancient times admir'd ours never knew.

All this time as in a fit of phrenfy I have spoken I scarce know what my selfe: I seare me too much, to, or of, my Country and Vniversity, and too litle for the present purpose. Now as one suddainly awaked out of sleep, no otherwise then in a dreame I remember the occasion: We have all a semel Insaminimus, and as a learned man of this Vniversity seemes to maintaine, no man hath ever had the happines to be exempted from this imputation: And therefore I hope my Reader will pardon me this once, if in such a generall concurse and conspiracy of mad men, I sometimes shew my selse mad for company.

Windy Regions produce men of wild and instable dispositions; but quiet regions more

constant and curteous.

The cause of this disparity is apparant; because a quiet mind, and apt for contemplation, cannot be in fuch a man, as is perpetually toffed to and fro. For no man can well contemplate, except he have his mind purged and free from motion of the body; and it is noted by Physiognomers that wiser men are slower in the motion of their body and mind, whereas mad and francicke men are alwaies bufied in body & mind. Hence a reason may be given why Mariners and seamen being continually toffed with the wind, are observed to be more barbarous, inhumane, and inconstant. Another reason of this inconstancie and change, may be drawne from the change of the Airs, caused by diversitie of winds; For wind being an exhalation affecting the aire and deriued from the Earth, multineeds be diverse in regard of the diverse regions, from whence it bloweth. What cause socuer be imagined, it is most certaine that people in windy regions have bin more warlike, though perhaps leffe humane: As in Thracia, France, Circaffia, Lybia, Portugall, Perfia, Noruegia, and Polonia: But in places in the fame tract where the wind bath a leffe M m * domi574 domination we shall find them more tractable, but leffe valiant, as Afria, Afia minor, Italy for the most part, and E-In like manner the people of Gallia Narbonenfis, Aquitary, and Provence in France, are observed to be the most warlike, although fituate in a more Souther e tract : Being daily infested, partly by the Vulturnus, partly by the Corns, which in these parts hath great power.

Sea borderers are generally more witty and adorned with more knowledge, then Inlanders, though subject to greater vices.

That Artes, Civility, and many inventions are owed to the fea, as the mother of encrease, seemes a matter out of quettion: For fith all nations have not found out all arts and innentions, it must follow necessarily, that they have bin propagated by traffick, and commerce with forraine nations: Whence it comes to paffe many times that fea-borderers by conference with out-landish people, have gotten that knowledge and experience of things, for which others have with great cost and danger adventured on long and tedious travailes: Which I take to be the reason why Themsstoeles would have a Citie depending on the fea, and not as Calins Rhodoginus imagines. that he might transferre the power from the nobility, to the (bip-mafters. Thus we find sciences and learning to have bin deriued from the Chaldeans to the Egyptians, from the Eexprians to the Phancians, from them to the Gracians and Romans: And in our daies every man can speake how much the industrie of the Venetians, Spaniards, Hollanders, English, and Portugalls have effected in both Indies, in trafficking with them, deriving together with their merchandice, much of their owne knowledge and religion. But as the Ilanders & Sea-bordering people have excelled the Inland nations in skill and knowledge, so also in vices: Which stands with reason, whether we ascribe it to their naturall wir or condition of life. or education. For the greatest wits are commonly matched with the greatest vices, as depending on such a temper of the braine whose smallest change may beget madnesse: accord'ng to that proverbe, Nullum magnum ingenium sine mixtura insansa. Also Aixes and Sciences turned to the worst vse, become more dangerous, then naked simplicity; for there is nothing to be feared more then armed surse. This might be the cause why Plato in his booke de Republica warnes men to avoide the sea, as the mother of wickednesse. Which is seconded by Strabo, who deriues the of-spring of Robberis, pillage, and murther, from the sea: By which argument, the old Athenians were enduced to draw the Inhabitants assuch as they could from sea-traffick to husbandry and tillage of the Earth: Whence came at his as some imagine) that sable of Neptune striuing with Minerva for victorie, against whom she prevailed, by shewing the judges a mandrakes apple as an ospeciall raricy of the land.

CHAP. XVI.

Of the dispositions of Inhabitants according to their Originall and Education.

diversitie of Inhabitants in disposition, either inrespect of their Of-spring, or their Education. In the former we are to consider the dispositions of nations so farre forth, as it depends from their first flocke and originals.

By the first stocke and originall of nations, we understand not heere either the first of spring from the loynes of Adam, or the second from Noah: because these we are common to all nations of the world, and therefore cannot vary the seuerall dispositions of people: But the more mediate or special stock whence they sprang, which is found to have no small power in the nature and temper of posteritie. In this of-spring two things are chiefely remarkeable; first, how people suffer an alteration in respect of their severall Transplantations: Secondly, in the mixture of colonies, both which we will shew in these Theorems.

I Colonies transplanted from one region into another, farre remote, retains a long time their first disposition, though by litle and litle they decline and suffer alteration.

All mutation requires a certaine distance of time: Sith no motion according to Aristotle is in an instant, neither is it & finall time can alter the naturall complexion of men: For afmuch as the children for the most part derive their nature from their parents, and every mans constitution is commonly radically grounded, and not easily subject to externall change: Thus wee see the Children of Blackmores being transplanted into Europe for diverse delcents to continue black: Yet fo as they by litle and litle declining from their former hue. will in time become white; as the rest of the European Inhabitants: For otherwise it must needs follow, that Septhia should at this day breed many Blackmores, and Ethiopia many white; because no question can be made, butthat all nations almost of the world fince the beginning have fuffred mixture. We reade that the Gothes, being a warlike people of the North, long after their first invasion of Spaine, France, Itaby, and other Territories of Europe, retained their owne dispofusion and nature, altogether disagreeing with the nations, amongst whom they lived: governing (as is the manner of Northerne Potentates) rather by Strength then Policy, better able to winne then establish an Empire. But in processe of time it came to paffe, that putting off their harfh temper they grew into one nation with the native Inhabitants, as in Franca and!

and Italy, or at least as in Spaine, establishing a government o their owne, by litle and litle declined from their radeneffe to civility, turning their armes to Artes, their strength to stratagemmes, having of late yeares by witty pollicy established a greater empire, then euer their Ancestours could atcheine by multitudes of men, and strength of armes. And it is worth observation, that as these have suffred a change of Lawes, enftomes, government, which they owe more to the nature of the Climate then to Education; so in their very language. For the language of the Gothes heeretofore, differed litle from the language of the ancient Germans, which(as most Northerna languages) was very rough, confifting of many hard and harth aspirations, with impleasant collision of many confanants together: But at this day is changed into a very elegant tongue pleafant to the eare, confifting of many vowels and the forcest aspirations. Finally such have bin the alterations of this people, that being heretofore far North, & branded with all the markes of Northerne rudenesse, they are now esteemed in the Catalogue of Somberne Inhabitants: Not in regard, as much of place, as nature. The like may we observe of the Turkes and Tartars, who foreading their empire from the North towards the South, a long time retained their jude barbarous nature, which they have not at this day altogether call off; yet fomuch hath time and place gained vpon their temper, that they are much mollified and farre more tractable to lumanity, addicting themselves every day more and more to the fludy of artes and civility infomuch that (as one obserues). had they not preserved their strict discipline in training vp. their youth to armes, they had long fince lost much of their large empire, and have yeelded to the Polonian and Muscovite . This change may we find not onely in mankind, but alfo in boufts and plantes, which being transported inco other. regions, though a long time retaining their native perfection, will not with standing in time by litle and litle degenerate: As I have heard by relation of some of out Virginian colony in America: who find a great alteration in our Corne and Cattle, translated thither . This might also be observed in the Mm 3 Danes ..

Danes, Saxons, and Angles, comming into Britanny, who partly by the Climate partly by mixture with them, by litle and little deposed their disposition, and became more evil. The like may be spoken of the Saxon colonies sent by Charles the great into Belgia, who since that time becomming more eivil have proved lesse warlike, loosing assuch by the one, as they obtained by the other. This point I will no further persecute, because I hold it sufficiently demonstrated out of that I have spoken of the variety of naturall dispositions according to the heavenly situation, and the soile. For fith a linations came at first from one original, we must needs ascribe this mutation to the places which they inhabite.

The mixture of Colonies begets in the same nation a greater diffaritie and varietie of the Inhabitants amongst themselves.

This proposition is by naturall confequence deduced from the former: Because all Colonies transplanted retaining fome-what of their fomer noture, the Mixture must produce varietie. First, because the number of people of any region by this is supposed to consist of more kinds of dispositions: 21, because the promiscuous mixture of these kindes being vnæqually rempered, must according to their seuerall cobinations produce people, as vnlike one to the other, as to the former. Hence a reason may be given, why the Inhibitants of the extreame regions, either North or South are found to be amongst themselves as well in temper, as in externall face & habite more like one to the other: whereas the middle pertake of more variety. For the Cimbrians, Danes, and other Scythians, are for the most part of a whitesh hue, with flaxen, and yellow baire; on the otherfide the Ethiopians for the most part are black-haired and curled. The French. Germans, and the English, admit of all varietie, having some white-haird some black, some yellow, some tawny, some freesth and some curled pares. This divertitie the Stoicks would afcribe to the phantafie, or image conceived in the minds of men. Whence they would give a cause, why beafts commonly bring

bring forth yong, more like one the other then men; because (fay they) wanting a reasonable soule they are not stirred up as men with fundry cogitations, but onely with fente. So the Scythian and Northerne man being by nature more fimple, & affecting those pleasures which are agreeable to nature, and leffe diffracted by variety of thoughts, is found to beget children more like their parents then th ofe of the middle elimate. This cause we should admit probable enough, but for a reason veged by Bodin and others, that in Athiopia, where the people of all other is more Acute, and more violest in lust, they are most like one to the other. For even all are found to be small of stature, curle-pared, black-skinned. flat-nofed, smooth-skinned, great-lip't, white-toothed, blackeyed: Wherefore this infinite divertity in the middle region. we cannot well ascribe to any other reason, then the manifold intermixtion and combination of both the extreames. Whence it comes to passe, that by how much more we wander from the middle region, somuch the more like shall we find the people amongst themselves: Insomuch as Tacitus spake of the Germans, that amongst themselves they were very like in respect of other nations. This mixture in the middle region out of the extreames, may eafily be shewed out of diverse Colonies, which from the extreames, have binne translated into the middle region, as the better place of habitation. For hither came the great and extraordinary armies of the Southians, Gothes, Turkes, and Tartars; None befides the Vandalls passed into Africke, from whence they were in short time ex. pulsed. The Arabians and Punicaans called by the ancient Saracens, leading their Colonies into Europe & Afia, fetled themselves in the middle region; None came into Scythia: for when they had invaded Spaine, Italy, and France, they were in France altogether broken, and cut off: After which, Spaine and Italy found a meanes to free themselves from their bondage. Likewise the Colonyes of the Celtes and Romans, endevoured alwaies to feetle themselves in the middle Regiear, and never ventured as far as Scythia Northward, or Southward as farre as Ethiopia: Whence the middle charged with:

with intermixture of both extreames begat a great diverfitie. For we find by experience, that out of the mixture of diverse kinds, diverse Formes and Natures are ingendred: As of the Mule, Leopard, Crocnta, Lycifca, and Camelopardus; which being mixt Creatures are valike their Sires : So may we iudge of the various mixture of diverle kinds of men. A Maftiffe or Lycifea, lite differs from a Wolfe, because he was conceined of a Wolfe and a Dogge; So that a Wolfe is as Varro noteth) nothing els then a wilde Dogge. But on the otherfide, a Mule from an Affeand a Horse, As a Camelopardin from a Panther and a Camell, differ very much; fo that if people very neere in Nature be linckt together, they produce an of-spring very like themselues: But if two very vnlike in nature, as an Æthiopian and a Scythian should match together, they must needs bring forth a birth very valike to themselves: like a Personated man brought upon the stage by Prolomans Philadephin, who (as Athenam writes) was of two colours, on one fide white, on the other black.

2 The second point whereby the disposition of people is varied, is *Education*. Education is the exercise of many people in re-

ligious, or morall discipline.

Amongst all externall causes of the change of dispositions, there is none greater then Education. For as a good nature is oftentimes corrupted with evill conversation, so an ill disposition with good institution hath in some fort bin corrected. The cheise objects of discipline are Religion and Morality; Whereof we give the cheisest prerogative to religion, as that which more immediatly bindeth the consciences of men, even against nature. In the second place Civility; whose end is worldly happines. How farre each of these pravaile, shall be shewed in these Theoremes.

Education hath great force in the alteration of naturall dispositions: yet so as by accident remitted

remitted, they soonereturne to their former temper.

The force of institution hath bin fo great, that by some it hath bin thought to aquall, if not furmount Nature; whence they have tearmed it a fecond nature : For as we fee all fortes of Plantes and Hearbs by good hulbandrie, to grow better, but lest to themselves to grow wilde and barren; So shall we find it, if not much more, in markind; which though never to Savage & barbarous, have by discipline bin corrected and reformed, and though neuer fo Polite and civil neglecting discipline, haue degenerated, and growne barbarous. For if the externall lineaments of the body may be by art (as it were) wrought into another mould, much more may we afcribe this to the habits and operations of the mind, being of a more agill nature, and apter to receive impression. The ancients amongst the French (as Bodin testifies) deemed a long vifage the most handsome: Whence the Midwittes ende voured to frame most faces to this fashion, as may be seene in most ancient statues & images. In India (as we also reade) a great nofe and a broad face was most admired: which caused their midwines to effect it as nere as they could in their tender infants. In like manner it hath binithe endeavour and ambition of most teachers, and informers of youth, to frame the wits of their nouices to fuch disciplines and perfections, as in the fime country found most honor & best acceptance. Hence it carre to passe that custome prevailing beyond nature, many nations fituate in a ruder climate, wanting that benefit of the Heanens which others plentifully enione, have surpassed them in Artes, Sciences, and many other Endowments of the minde. In so triviall a matter we will not roue farre for example. It is recorded by the ancients aswell of the Germans, as of our owne nation, that they lived almost in the condition of wilde beafts in Woods & Defarts, feeding like swine on hearbs and rootes, without law or discipline: Insomuch as their Bardes or leatned men (as they deem'd them) wanting the vie of lerters, challenged their cheifest perfection in the composure Nu ' of

of certaine rimes of triviall subjects to ple fe the people. Their boufes were caues, their palla es brakes and thickets, their tables rocker (as one faith of them) Antra lares, dumeta thiros, camerals rupes. They were as Infime speakes of the infancy of the world) rather carefull to keepe their owne, then ambitious to conquer others; and more fludious to preferue life then feeke honour. Their onely law was nature, or fone few cult mes preserved by tradition, not writing: Little differing from the present Americans, not yet reduced to civiluty. But time and discipline prevailing against barbarisme. they are (God be praised) reduced to such a height of civility, that they may (as it were) reade other mens wantes in their owne perfections, and measure other mens losse by their owne games. In fomuch as they seeme to have robbed the Afatickes of humanitie, the Romans of militarie Discipline. the Hebrewes of Religion, the Gracians of Philosophie, the Exprians of Geometrie, the Phanicians of Arithmetick, the Chaldeans of Aftrologie, and almost all the world of curious Workmansbip. This their excellency hath bin fo fortunate, as to let them in the envy of other nations, who not with standing have bin faine to borrow of their store. The Italians are censured by Machiavell the Florentine for sending for Germans to measure their land, challenging to themselves the proregative of wit above other nations. Likewise Pope Leo dispatched his Embassador into Germany for Mathematicsans, to rectifie the calender, as fornetimes Cafar into Egypt. This force of discipline how great socuer being for a time neglected, nature is not with flanding found to returne to her owne corruption. A prime example of it we have in the Romans and Italians, heeretofore for Artes and Military discipline carrying away the palme from the whole world: But now degenerated to much, as it may feeme the image of bafeweffe; Submitting their neckes to the pride of an infulting Prelate, faire more abject then the loffe of their libertie under Cafar, or the Goth by furpation of Alaricus. The like effect of this neglect of discipline may we find in the Hebrewes, Chaldeans, Phanicians, Egyptians, Gracians, and Indians, who who were sometimes admired for learning and Eloquence, and see in the highest top of persection. Wherefore Anssorbe had good reason in his first booke do Coolo to affirme, that Artes and Sciences with all nations had bin subject to obbes the standard form formers from standard from and sometimes languishing and contemned. And to this and no other cause, can we astribe the present Ignorance and Karhardine of the Americans: Their descent being from Noah auch his posterity, they could not at first but have some forme of discipline, which afterwards being by long processe of time or incertainty of tradition neglected & obliterated, they fell back into such waies as their owne deprayed nature dictated or the devill malitiously suggested.

By Discipline nations become more wise & politick in the preservations of states, yet lesse stout & couragious.

As Discipline hath bin the cheife cause of the establishment of all flates, fo bath it on the other fide bin occasion to foften and weaken the courage of many nations : For it hath binne many times feene, that fuch people who have bin commended for wit, have yeelded to fuch who are of a ruder diffosition: as at this day the Greekes and Macedons to the Turkes, the ancient Caules to the French, the Agyptians to the Perfians, the Chaldeans to the Saracens, Hence some give a reason why the French did invade and runne over Italy without controle under Cherles the 5; because the Italian Princes at that time were given to fludy and learning; and it is observed that the ancient courage of the Turke is much abated, fince the tine that they grew more civill and more firefly imbraced discipline. And this tome thinke to have given eccasion to Alexander the great, to conquer the Perfian Monarchie, the Ferfians law rg bin before reduced to civility, and left their hardnesse. And we daily see by experience, that no men are n ore desperate and adventureus, then those which are rude & barbarous, warring allgood manners & education. None more fearfull and many times more convardiske then N n 2 fuch

fuch as are most wife and politick: an example of the former we have in Aiax, of the other in Uliffes, wherevpon the wifelt traders and commanders have not bin effeemed the most valiant. A certaine English gentleman writing military obferuations affirmes the French nobility to be more valorous & couragious then the English: Because of the loosenesse of their descapline and the strictnes of ours. But I will neither grant him the one or the other, neither can I averre their conrage to be greater, or our discipline ftricter. If their valour be more it must needs follow their mit is lesse out of this ground. But howfoeuer it be, I am fure that Cafar and Tasitus give the cause of the great stature and courage of the Germans to be their loofeneffe and liberty, which howbeit it be not the fole cause, it must needs be a great helpe. For we plainely finde by experience, that those countries which be most mountanous where is leffe discipline, are found to produce men for the most part, most warlike: Such as the Suitzers in Germamy and Biscarnes and Arragonians in Spaine. Whence (as some obserue) such countries as are partly Mountanous, partly plains are seldome at quiet, the one part willingly fubmitting themselves to government, the other affecting warre and rebellion. Which hath bin the cause of the troubles of Naples, and in England before Henry the eight's time betwixt the Welfh and English . Why discipline should in this fort mollifie and weaken the courage of men, many causes may be given. The first and greatest is Religion, then the which, there is no greater curbe to the couraget not meerely of it felfe, but by accident; Because Death being the greatest hazard of a foldier, religion gives a more evident apprehension & sense of the immortality of the soule of man, and sets before the eye of his vinderstanding, as it were the images of Hell-paines and Calestiall ioyes, weighing in an aquall scale the danger of the one, and the loffe of the other. Whereas ignorant people wanting all sense of Ireligion lightly esteeme of either, holding a temporall death the greatest danger . Whence grew the viuail Proverbe amongst profane Ruffians; that conscience makes comards. But this (as I faid) is meerely

ly accidentall: For asmuch as nothing spurres on a true reso. lution more then a good conscience, and a true touch of religion; witheffe the holy Martyrs of the Church of all ages. whose valour and constancie hathoutgone all heathen presidents. But because toldiers for the most part, being a most diffolute kinde of people, having either a falle religion which can fuggest no fetled resolution, or an ill conscience grounded vpon no affurance, Religion must needs beget in them a more fearefull disposition. Another cause may be the severity of discipline, which especially in the training vp of youth, is mixed with a kind of flavery: without which our yonger yeares are very vnttactable to tast the bitter roots of knowledge. This feare (as it were) stamped in our affections cannot but leave behind it a continuall impression, which cannot suddainly be razed out. Such as we find in vs of our masters & teachers, whole freindship we rather imbrace, then familiarity. A third reason, why discipline would weaken and mollifie a nation, may be the delight which men reape in Contemplatme studies, and morall or politick duties, whence followes a neglect of the other. For people of knowledge must needs finde a greater falicity in giftes of the mind, which is viually seconded with a contempt of externall and military affaires. The last cause may be the want of vie and practise of military affaires in most common-wealths; for many states wellestablished continue a long time without wartes, neither molesting their neighbours, nor diffenting amongst themselves;except very feldome, and that by a small army, without troubling the whole state: whence the generall practife being lesse knowne, becomes more searefull. Notwithstanding, all this it were branish to imagine discipline any way vaneseffary or hurtfull, cither to a captaine or ftatesman. For afmuch as it more frengthens the wit then abates the courage of a nation. Neither is it properly faid to breake and weaken, but rather to temper and regulate our spirits. For it is not valour, but rather rashues or fiercenes, which is not managed with policy and discretion. And although it hath sometimes bin attended with notable exploites, as that of Alexander the: Nn'3

the great, of the Gother, the ancient Gaules and many other. Yet shall we oblerue such conquelts, to be of small continu . ance: For what they atcheived by frength, they loft for want of policy. So that it is well faid by one: that moderation is the mother of continuance, to States and Kingdomes. Thus have we runne ouer (by Ged's affishance) the cheife canfes of diversitie of dispositions of Nations: Wherein if any man will enforme himselfe (as he should) he must compare one circumftance with another, and make his judgement not from a man but a nation; and not censure any nation out of one obscrvation: For practise in Art cannot alwaies come home to speculation. So experience in this kinde will oftentimes crosse the most generall rules we can imagine. Tis enough to judge as we find, and walke where the way is open; If any man will defire more cariofitie, he may spend more labour to lesse purpose. Let every man by beholding the nationall vises of other men, praise Almighty God for his owne happines: and by feeing their vertues, learne to correct his owne vices. So should our travaile in this Terrestriall Globe be our direct way to Heaven: And that aternall guide should conduct vs which can neuer erre: To whom be ascribed all Glory, Praise, and Power, for euermore.

Deo triuni Laus in æternum.

FIXIS.

